SBIR

Small Business Innovation Research

FY 2005

NOAA Program Solicitation

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U.S. DEPARTMENT OF COMMERCE
http://www.oar.noaa.gov/ORTA/SBIR

TABLE OF CONTENTS

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

PROGRAM SOLICITATION FOR SMALL BUSINESS INNOVATION RESEARCH

1.0 PROGRAM DESCRIPTION

1.1 Introduction

The Department of Commerce (DOC) National Oceanic and Atmospheric Administration (NOAA), invites small businesses to submit research proposals under this solicitation. Firms with strong research capabilities in any of the areas listed in Section 8 of this solicitation are encouraged to participate. **Unsolicited proposals are not accepted under the Small Business Innovation Research (SBIR) program.**

Objectives of this program include stimulating technological innovation in the private sector and strengthening the role of small business in meeting Federal research and development (R&D) needs. This program also seeks to increase the commercial application of innovations derived from Federal research and to foster and encourage participation by socially and economically disadvantaged and woman-owned small businesses. Also, in accordance with E.O. 13329, the NOAA SBIR program will give a high priority, where feasible, to proposals that are directed toward innovations that will aid the manufacturing sector of the Nation's economy.

1.2 Three-Phase Program

The "Small Business Innovation Research Program Reauthorization Act of 2000" requires the Department of Commerce to establish a three-phase SBIR program by reserving a percentage of its extramural R&D budget to be awarded to small business concerns for innovation research.

The funding vehicles for NOAA's SBIR program in both Phase I and Phase II are contracts. This document solicits Phase I proposals only.

NOAA has the unilateral right to select SBIR research topics and awardees in both Phase I and Phase II, and to award several or no contracts under a given subtopic.

1.2.1 Phase I – Feasibility Research

The purpose of Phase I is to determine the technical feasibility of the proposed research and the quality of performance of the small business concern receiving an award. Therefore, the proposal should concentrate on research that will significantly contribute to proving the feasibility of the proposed research, a prerequisite to further support in Phase II.

1.2.2 Phase II – Research and Development

Only firms that are awarded Phase I contracts under this solicitation will be given the opportunity for submitting a Phase II proposal immediately following completion of Phase I. Phase II is the R&D or prototype development phase. It will require a comprehensive proposal outlining the research in detail and a plan to commercialize the final product. NOAA may require delivery of the prototype. Each Phase II applicant will be required to provide information for the SBA Tech-Net Database System (http://tech-net.sba.gov), when advised this system can accept their input.

Further information regarding Phase II proposals and Tech-Net requirements will be provided to all firms receiving Phase I contracts.

1.2.3 Phase III – Commercialization

In Phase III, it is intended that non-SBIR capital be used by the small business to pursue commercial applications of Phase II.

1.3 Eligibility

Each organization submitting a proposal **must** qualify as a small business (Section 2.1) for research or R&D purposes (Section 2.2) at the time of the award. In addition, the primary employment of the principal investigator must be with the small business at the time of the award and during the conduct of the research. More than one-half of the principal investigator's time must be spent with the small business for the period covered by the award. **Primary employment with a small business precludes full-time employment with another organization. The NOAA program manager in consultation with the contracting officer must approve deviation from these requirements.**

Also, for both Phase I and Phase II, the work must be performed in the United States. "United States" means the fifty states, the territories and possessions of the United States, the Commonwealth of Puerto Rico, the District of Columbia, the Republic of the Marshall Islands, the Federated States of Micronesia, and the Republic of Palau. **The NOAA program Manager in consultation with the contracting officer may approve exceptions to this requirement.**

Joint ventures and limited partnerships are eligible, provided the entity created qualifies as a small business as defined in this solicitation. **Consultative arrangements between firms and universities or other non-profit organizations are encouraged, with the small business serving as the prime contractor.**

1.4 Contact with NOAA

In the interest of competitive fairness, oral or written communication with NOAA or any of its components concerning additional information on the technical topics described in Section 8 of this solicitation **is prohibited**.

Requests for general information on the NOAA SBIR program may be addressed to:

Dr. Joseph M. Bishop, NOAA SBIR Program Manager
1335 East West Highway, SSMC1, Station 106
Silver Spring, MD 2090 – 3284
Telephone: (301) 713-3565, Fax: (301) 713-4100

Information sources are listed in Section 7.

2.0 DEFINITIONS

2.1 Small Business Concern

A Small Business Concern is one that, at the time of award for Phase I and Phase II:

(a) is independently owned and operated, is organized for profit, is not dominant in the field of operation in which it is proposing, and has its principal place of business located in the United States (Section 1.3);

(b) is at least 51 percent owned, or in the case of a publicly owned business, at least 51 percent of it's voting stock is owned by United States citizens or lawfully admitted permanent resident aliens; and

(c) has, including its affiliates, a number of employees not exceeding 500, and meets the other small business regulatory requirements found in 13 Code of Federal Regulations Part 121. Business concerns are affiliates of one another when, either directly or indirectly, (1) one concern controls or has the power to control the other, or (2) a third party controls both. Control can be exercised through common ownership, common management, and contractual relationships. Business concerns include, but are not limited to, any individual, partnership, joint venture, association, or cooperative.

2.2 Research or Research and Development

Any activity that is (a) a systematic, intensive study directed toward greater knowledge or understanding of the subject studied; (b) as systematic study directed specifically toward applying new knowledge to meet a recognized need; or (c) a systematic application of knowledge toward the production of useful materials, devices, systems, or methods, and includes design, development, and improvement of prototypes and new processes to meet specific requirements.

In general, the NOAA SBIR program will fund Phase I and Phase II proposals with objectives that can be defined by (b) and (c) above.

2.3 Socially and Economically Disadvantaged Small Business Concern

Is one that is:

(a) at least 51 percent owned by (1) an American Indian tribe or a native Hawaiian organization, or (2) one or more socially and economically disadvantaged individuals, and

(b) controlled by one or more such individuals in its management and daily business operations.

A socially and economically disadvantaged individual is defined as a member of any of the following groups: Black Americans, Hispanic Americans, Native Americans, Asian-Pacific Americans, Subcontinent Asian Americans, or any other individual found to be socially and economically disadvantaged by the Small Business Administration (SBA) pursuant to Section 8(a) of the Small Business Act, 15 U.S. Code (U.S.C.) 637(a).

2.4 Women-Owned Small Business

A small business that is at least 51 percent owned by a woman or women who also control (meaning to exercise the power to make policy decisions) and operate (meaning being actively involved in the day-to-day management) the small business.

2.5 Funding Agreement

The funding vehicles for NOAA's SBIR program in Phase I and Phase II are contracts.

2.6 Subcontract

This is any agreement, other than one involving an employer-employee relationship, entered into by the Federal Government funding awardee, calling for supplies or services required solely for the performance of the original funding agreement.

2.7 Commercialization

This is locating or developing markets and producing and delivering products or services for sale (whether by the originating party or by others). As used here, commercialization includes both Government and private sector markets.

3.0 PROPOSAL PREPARATION INSTRUCTIONS AND REQUIREMENTS

3.1 Proposal Requirements

The objective is to provide sufficient information to demonstrate that the proposed work represents a sound approach to the investigation of an important scientific or engineering innovation worthy of support. **The proposal must meet all the requirements of the subtopic in Section 8 to which it applies.** A proposal must be self-contained and written with all the care and thoroughness of a scientific paper submitted for publication. It should indicate a thorough knowledge of the current status of research in the subtopic area addressed by the proposal. **A proposal will not be deemed acceptable if it represents presently available technology.** Each proposal should be checked carefully by the offeror to ensure inclusion of all essential material needed for a complete evaluation. The proposal will be peer reviewed as a scientific paper. All units of measurement should be in the metric system.

NOAA reserves the right not to submit to technical review any proposal which has insufficient scientific and technical information, or one which fails to comply with the administrative procedures as outlined in the NOAA/SBIR Checklist in Section 10.

The proposal must not only be responsive to the specific NOAA program interests described in Section 8 of the solicitation, but also serve as the basis for technological innovation leading to **new commercial products, processes, or services.** An organization may submit different proposals on different subtopics or different proposals on the same subtopic under this solicitation. When the proposed innovation applies to more than one subtopic, the offeror must choose that subtopic which is most relevant to the offeror's technical concept.

Proposals principally for the commercialization of proven concepts or for market research must not be submitted for Phase I funding, since such efforts are considered the responsibility of the private sector.

The proposal should be direct, concise, and informative. Promotional and other material not related to the project shall be omitted. **The Phase I proposal must provide a description of potential commercial applications.**

3.2 Phase I Proposal Limitations

- Page Length - **no more than 25 pages**, consecutively numbered, including the cover page, project summary, main text, references, resumes, any other enclosures or attachments, and the proposal summary budget.

- Paper Size - must be 21.6 cm X 27.9 cm (8 ½" X 11").

- Print Size - **must be easy to read with a fixed pitch font of 12 or fewer characters per inch or proportionally spaced font of point size 10 or larger with no more than six lines per inch. Margins should be at least 2.5cm.**

Supplementary material, revisions, substitutions, audio or videotapes, or computer floppy disks will **not** be accepted.

Proposals not meeting these requirements will be returned without review.

3.3 Phase I Proposal Format

3.3.1 Cover Sheet

Complete Section 9.1 "Cover Page" as page 1 of each copy of each proposal. **NO OTHER COVER WILL BE ACCEPTED.** Xerox copies are permitted.

3.3.2 Project Summary

Complete Section 9.2 "Project Summary" as page 2 of your proposal. The technical abstract should include a brief description of the problem or opportunity, the innovation, project objective, and technical approach.

In summarizing anticipated results, include technical implications of the approach (for both Phase I and II) and the potential commercial applications of the research. **The Project Summary of the proposals that receive an award will be published by NOAA and, therefore, must not contain proprietary information.**

3.3.3 Technical Content

Beginning on page 3 of the proposal, include the following items with headings as shown:

(a) **Identification and Significance of the Problem or Opportunity.** Make a clear statement of the specific research problem or opportunity addressed, its innovativeness, commercial potential, and why it is important. Show how it applies to a specific subtopic in Section 8.

(b) **Phase I Technical Objectives.** State the specific objectives of the Phase I effort, including the technical questions it will try to answer to determine the feasibility of the proposed approach.

(c) **Phase I Work Plan.** Include a detailed description of the Phase I R&D plan. The plan should indicate not only what will be done, but also where it will be done, and how the R&D will be carried out. The methods planned to achieve each objective or task should be discussed in detail. **This section should be at least one-third of the proposal.**

(d) **Related Research or R&D.** Describe research or R&D that is directly related to the proposal, including any conducted by the principal investigator or by the proposer's firm. Describe how it relates to the proposed effort, and describe any planned coordination with outside sources. **The purpose of this section is to persuade reviewers of the proposer's awareness of recent development in the specific topic area and assure them that the proposed research represents technology presently not available in the marketplace.**

(e) **Key Personnel and Bibliography of Related Work.** Identify key personnel involved in Phase I, including their related education, experience, and publications. Where resumes are extensive, summaries that focus on the most relevant experience and publications are suggested. List all other commitments that key personnel have during the proposed period of contract performance.

(f) **Relationship with Future R&D.** Discuss the significance of the Phase I effort in providing a foundation for the Phase II R&D effort. Also state the anticipated results of the proposed approach, if Phases I and II of the project are successful.

(g) **Facilities and Equipment.** The conduct of advanced research may require the use of sophisticated instrumentation or computer facilities. The proposer should provide a detailed description of the availability and location of the facilities and equipment necessary to carry out Phase I.

(h) **Consultants and Subcontracts.** The purpose of this section is to convince NOAA that: (1) research assistance from outside the firm materially benefits the proposed effort, and (2) arrangements for such assistance are in place at the time the proposal is submitted.

Outside involvement in the project is encouraged where it strengthens the conduct of the research; such involvement is not a requirement of this solicitation.

1. Consultant – A person outside the firm, named in the proposal as contributing to the research, must provide a signed statement confirming his/her availability, role in the project, and agreed consulting rate for participation in the project. **This statement is part of the page count.**

2. Subcontract – Similarly, where a subcontract is involved in the research, the subcontracting institution must furnish a letter signed by an appropriate official describing the programmatic arrangements and confirming its agreed

participation in the research, with its proposed budget for this participation. **This letter is part of the page count.**

(i) **Potential Commercial Applications and Follow-on Funding Commitment.** Describe in detail the commercial potential of the proposed research, how commercialization would be pursued, benefits over present products on the market, and potential use by the Federal Government.

(j) **Cooperative Research and Development Agreements (CRADA).** State if the applicant is a current CRADA partner with NOAA, or with any other Federal agency, naming the agency title of the CRADA, and any relationship with the proposed work.

(k) **Guest Researcher.** State if the applicant is a guest researcher at NOAA, naming the sponsoring laboratory.

(l) **Cost Sharing.** Cost participation could serve the mutual interest of NOAA and certain SBIR contractors by helping to assure the efficient use of available resources. Except where required by other statutes, NOAA does not encourage or require cost sharing on Phase I projects, nor will cost sharing be a consideration in evaluation of Phase I proposals.

3.4 Equivalent Proposals or Awards

A firm may have received other SBIR awards or elected to submit essentially equivalent proposals under other SBIR program solicitations. In these cases, a statement **must** follow the Technical Content section in the proposal indicating:

(a) the name and address of all agencies to which a proposal was submitted or from which an SBIR award was received;

(b) the date of proposal submission or date of award;

(c) the title, number, and date of the SBIR program solicitation under which a proposal was submitted or award received;

(d) the specific applicable research topic for each proposal submitted or award received

(e) the title of the research project; and

(f) the name and title of the principal investigator for each proposal submitted or award received.

If no equivalent proposal is under consideration or equivalent award received, a statement to that effect **must** be included in this section.

3.5 Prior SBIR Phase II Awards

If a small business concern has received one or more Phase II awards from any of the Federal agencies in the prior five fiscal years, it must submit on a separate page, the names of awarding agencies, dates of awards, funding agreement numbers, amounts, topic or subtopic titles, follow-on agreement amounts, sources and dates of commitments, and current commercialization status for each Phase II. **This required information shall not be part of the page count limitation.**

3.6 Proposed Budget

Complete the "NOAA/SBIR Proposal Summary Budget" (Section 9.3) for the Phase I effort, and include it as the last page of the proposal. Some items on this form may not apply. Enough information should be provided to allow NOAA to understand how the offeror plans to use the requested funds if the contract is awarded. A complete cost breakdown should be provided giving labor rates, proposed number of hours, overhead, G&A, and profit. A reasonable profit will be allowed. When proposing travel, identify the number of trips, people involved, labor categories, destination of travel, duration of trip, commercial airfare or mileage rate, per diem expenses, and purpose of travel. Budgets for travel funds must be justified and related to the needs of the project. Where equipment is to be purchased, list each individual item with the corresponding cost. The inclusion of equipment will be carefully reviewed relative to need and appropriateness. The inclusion of equipment will be carefully reviewed relative to need and appropriateness for the research proposed. Equipment is defined as an article of nonexpendable, tangible property having a useful life of more than one year and an acquisition cost of $5,000 or more per unit.

SBA Policy requires that NOAA not issue SBIR awards that include provisions for subcontracting any portion of the contract back to the originating agency or any other Federal Government agency or to other units of the Federal Government. Requests for waivers from this requirement must be sent to the NOAA program manager.

For Phase I, the proposing firm must perform a minimum of two-thirds of the research and/or analytical effort. The total cost for all consultant fees, facility leases, usage fees, and other subcontract or purchase agreements may not exceed one-third of the total contract. For Phase II, the proposing firm must perform one-half of the research and/or analytical effort.

4.0 METHOD OF SELECTION AND EVALUATION CRITERIA

4.1 Introduction

All Phase I and II proposals will be evaluated on a competitive basis. Each Phase I proposal will be screened by NOAA to ensure that it meets the administrative requirements outlined in Section 4.2. Proposals that meet these requirements will be peer reviewed, undergo competition within each laboratory, and may also undergo a third round of competition across the agency.

4.2 Phase I Screening Criteria

To avoid a misunderstanding, small businesses are cautioned that Phase I proposals not satisfying all the screening criteria shall be returned without peer review and eliminated from consideration for a contract. Proposals may not be resubmitted (with or without revisions) under this solicitation. All copies of proposals that fail the screening process will be returned. The screening criteria are:

(a) The proposing firm must qualify as a small business (Section 2.1). If it is a subsidiary of another firm, this limit applied to all employees under control of the parent organization.

(b) The Phase I proposal must meet **all** of the requirements stated in Section 3.

(c) The Phase I proposal must be limited to one subtopic and clearly address research for that subtopic.

(d) **Phase I proposal budgets must not exceed $75,000 (except subtopics with the suffix "SG", which are limited to $50,000).**

(e) **The project duration for the Phase I research must not exceed six months beginning on the contract start date.**

(f) The proposing firm must carry out a minimum of two-thirds of expenditures under each Phase I project.

(g) The proposal must contain information sufficient to be peer reviewed as research.

4.3 Phase I Evaluation and Selection Criteria

Phase I proposals will be rated by NOAA and/or external scientists or engineers with equal consideration given to the following criteria, except for item (a), which will receive twice the value of any of the other items:

(a) The scientific and technical merit of the Phase I research plan and its relevance to the objectives, with special emphasis on its innovativeness and originality.

(b) Importance of the problem or opportunity and anticipated benefits of the proposed research to NOAA, and the commercial potential, if successful.

(c) How well the research objectives, if achieved, establish the feasibility of the proposed concept and justify a Phase II effort.

(d) Qualifications of the principal investigator(s), other key staff, and consultants, and the probable adequacy of available or obtainable instrumentation and facilities.

Technical reviewers will base their ratings on information contained in the proposal. It cannot be assumed that reviewers are acquainted with any experiments referred to, key individuals and facilities.

Final award decisions will be made by NOAA based upon ratings assigned by reviewers and consideration of additional factors, **including possible duplication of other research**, the importance of the proposed research as it relates to NOAA needs, and the availability of funding. NOAA may elect to fund several or none of the proposals received on a given subtopic. Approximately one-third of subtopic areas are generally funded in this solicitation. Upon selection of a proposal for a Phase I award, NOAA reserves the right to negotiate the amount of the award.

4.4 Phase II Evaluation and Selection Criteria

The Phase II proposal will undergo NOAA and external peer review for the purpose of determining overall technical or scientific merit. Review panels (one for subtopics identifies as “SG”, and one for all other subtopics), composed of senior technical specialists, will make the final Phase II selection decision based on the written reviews and the company presentation to the panel. Each of the following evaluation criteria will receive approximately equal weight, except for item (a), which will receive twice the value of any of the other items:

(a) The scientific and technical merit with emphasis on innovation and originality.

(b) Degree to which the Phase I objectives were met.

(c) The commercial potential of the proposal as evidenced by: a) a record of commercialization, b) the existence of Phase II funding commitments from non-SBIR sources, c) existence of Phase III follow-on commitments, and d) the presence of other indications of commercial potential of the research.

(d) The adequacy of the Phase II objectives to meet the problem or opportunity.

(e) The qualifications of the principal investigator and other key personnel to carry out the proposed work.

Upon selection of a proposal for Phase II award, NOAA reserves the right to negotiate the amount of the award. NOAA is not obligated to fund any specific Phase II proposal.

4.5 Release of Proposal Review Information

After final award decisions have been announced, the technical evaluations of a proposal will be provided to the proposer only upon written request and for a period not to exceed 90 days. The identity of the reviewers will not be disclosed.

5.0 CONSIDERATIONS

5.1 Awards

Contingent upon availability of funds, NOAA anticipates making about **20** Phase I firm-fixed-price contracts of no more than **$75,000** each (except for subtopics with the suffix "SG", which are limited to $50,000). Performance period, with no exception, shall be no more than six months beginning on the contract start date. Historically, NOAA has funded about ten percent of the Phase I proposals submitted which is approximately one-third of the subtopic areas.

Phase II awards shall be for no more than 300,000 (except for subtopics with the suffix "SG", which are limited to $200,000). The period of performance in Phase II will depend upon the scope of the research, but should not normally exceed 24 months.

It is anticipated that **approximately one-third of the Phase I awardees will receive Phase II awards**, depending upon the availability of funds. To provide for an in-depth review of the Phase I final report and the Phase II proposal and commercialization plan, Phase II awards will be made approximately seven months after the completion of Phase I.

For planning purposes, proposers should understand that Phase I awards are made in July, Phase II proposals are due the following February, and Phase II awards are made during August and September.

This solicitation does not obligate NOAA to make any awards under either Phase I or Phase II. Furthermore, NOAA is not responsible for any monies expended by the proposer before award of any contract resulting from this solicitation.

5.2 Reports

Six copies of a final report on the Phase I project shall be submitted to NOAA upon completion of the Phase I research. The final report shall include a single-page project summary as the first page, identifying the purpose of the research, and giving a brief description of the research carried out, the research findings or results, and the commercial applications of the research in a final paragraph. The remainder of the report should indicate in detail the research objectives, research work carried out, results obtained, and estimates of technical feasibility.

All final reports must carry an acknowledgement on the cover page such as: "This material is based upon work supported by the Department of Commerce under contract number _____. Any opinions, findings, conclusions or recommendations expressed in this publications are those of the author(s) and do not necessarily reflect the views of the Department of Commerce."

Progress reports in a brief letter format will be required also.

5.3 Payment Schedule

The specific payment schedule (including payment amounts) for each contract will be incorporated into the contract upon completion of negotiations between the Government and the successful Phase I or Phase II contractor.

5.4 Proprietary Information, Inventions, and Patents

5.4.1 Limited Rights in Information and Data

Information contained in unsuccessful proposals will remain the property of the proposer, except that the "Project Summary" page may be made available to a limited audience through the SBA Tech-Net System. The Government may, however, retain copies of all proposals. Any proposal, which is funded, will not be made available to the public, except for the "Project Summary" page.

The inclusion of proprietary information is discouraged unless it is absolutely necessary for the proper evaluation of the proposal.

Proprietary information submitted to NOAA will be treated in confidence, to the extent permitted by law, if it is confined to a separate page with a numbering system key, and marked with a legend reading: "Following is proprietary information which (name of proposing firm) requests not be released to persons outside the Government, except for purposes of evaluation."

Any other legend will be unacceptable to NOAA and may constitute grounds for return of the proposal without further consideration. Without assuming any liability for inadvertent disclosure, NOAA will limit dissemination of such information to its employees and, where necessary for evaluation, to outside reviewers on a confidential basis.

Since technical reports may eventually be made available to the public, such reports shall not contain any language limiting their use other than for SBIR data as described below.

5.4.2 Copyrights

The contractor may normally establish claim to copyright any written material first produced in the performance of an SBIR contract. If a claim to copyright is made, the contractor shall affix the applicable copyright notice of 17 U.S.C. 401 or 402 an acknowledgment of Government sponsorship (including contract number) to the material when delivered to the Government, as well as when the written material or data are published or deposited for registration as a published work in the U.S. Copyright Office. For other than computer software, the contractor gives to the Government, and others acting on its behalf, a paid-up, nonexclusive, irrevocable, worldwide license to

reproduce, prepare derivative works, distribute copies to the public, and perform publicly and display publicly, by or on behalf of the Government.

For computer software, the contractor gives to the Government, and others acting on its behalf, a paid-up, nonexclusive, irrevocable, worldwide license for all such computer software to reproduce, prepare derivative works, and perform publicly and display publicly, by or on behalf of the Government.

5.4.3 Data Rights

Except for copyrighted data, the Government shall normally have unlimited rights to data in Phase I, II, or III awards, such as:

(a) data specifically identified in the SBIR contract to be delivered without restriction;

(b) form, fit, and function data delivered under the contract;

(c) data delivered under the contract that constitute manuals or instructions and training material for installation, operation, or routine maintenance and repair of items, components, or processes delivered or furnished for use under the contract; and

(d) all other data delivered under the contract unless identified as SBIR data.

According to Federal Acquisition Regulation 52.227-20, Rights and Data – SBIR Program (March 1994), the contractor is authorized to affix the following "SBIR Rights Notice" to SBIR data delivered under the contract:

SBIR RIGHTS NOTICE

These SBIR data are furnished with SBIR rights under Contract No. _____ (and subcontract _____, if appropriate). For a period of four years after acceptance of all items to be delivered under this contract, the Government agrees to use these data for Government purposes only, and they shall not be disclosed outside the Government (including disclosure for procurement purposes) during such period without permission of the contractor, except that, subject to the forgoing use and use by support contractors. After the aforesaid four-year period, the Government has a royalty-free license to use, and to authorize others to use on its behalf, these data for Government purposes, but is relieved of all disclosure prohibitions and assumes no liability for unauthorized use.

(END OF NOTICE)

The Government's sole obligation with respect to any properly identified SBIR data shall be as set forth in the paragraph above. The four-year period of protection applies for Phases I, II, and III.

5.4.4 Patents

Small business firms normally may retain the worldwide patent rights to any invention made with NOAA support. As described in more detail in FAR 52.227-11, NOAA receives a royalty-free license for Federal Government use, reserves the right to require the patent holder to license others in certain circumstances, and requires that anyone exclusively licensed to sell the invention in the United States must substantially manufacture it domestically. To the extent authorized by 35 U.S.C. 205, NOAA will not make public any information disclosing a NOAA-supported invention to allow the contractor a reasonable time to pursue a patent (less than four years). SBIR awardees must report inventions to NOAA within two months of the inventor's notice to the awardee.

5.5 Awardee Commitments

Upon the award of a contract, the contractor will be required to make certain legal commitments. The outline that follows illustrates the types of provisions that will be included in the Phase I contract.

(a) Standards of Work. Work performed under the contract must conform to high professional standards.

(b) Inspection of Work. Work performed under the contract is subject to Government inspection and evaluation at all reasonable times.

(c) Examination of Records. The Comptroller General (or a duly authorized representative) shall have the right to examine pertinent records of the contractor involving transactions related to this contract.

(d) Default. The Government may terminate the agreement if the contractor fails to perform the work contracted.

(e) Termination for Convenience. The Government may terminate the contract at any time if it deems termination to be in the best interest, in which case the contractor will be compensated for work performed and for reasonable termination costs.

(f) Disputes. Any dispute about the contract, which cannot be resolved by agreement, shall be decided by the Contracting Office with right to appeal.

(g) Contract Work Hours. The contractor cannot require an employee to work more than eight hours a day or 40 hours a week, unless the employee is compensated accordingly (i.e., received overtime pay).

(h) Equal Opportunity. The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin.

(i) Affirmative Action for Veterans. The contractor will not discriminate against any employee or applicant for employment because he or she is a disabled veteran or veteran of the Vietnam era.

(j) Affirmative Action for the Handicapped. The contractor will not discriminate against any employee or applicant for employment because he or she is physically or mentally handicapped.

(k) Officials Not to Benefit. No Government official shall benefit personally from any SBIR contract.

(l) Covenant Against Contingent Fees. No person or agency has been employed to solicit or secure the contract upon an understanding for compensation, except bona fide employees or commercial agencies maintained by the contractor for the purpose of securing business.

(m) Gratuities. The Government may terminate the contract if any gratuity has been offered to any representative of the Government to secure the contract.

(n) Patent Infringement. The contractor shall report each notice or claim of patent infringement based on the performance of the contract.

(o) American-Made Equipment and Products. When purchasing either equipment or a product with funds provided through the contract, purchase only American-made equipment and products to the extent possible, in keeping with the overall research needs of the project.

5.6 Additional Information

(a) Projects. The responsibility for the performance of the principal investigator, and other employees or consultants, who carry out the proposed work, lies with the management of the organization receiving an award.

(b) Organizational Information. Before award of an SBIR contract, the Government may request the proposer to submit certain organizational,

management, personnel, and financial information to assure responsibility of the proposer.

(c) **Duplicate Awards. If an award is made under this solicitation, the contractor will be required to certify that he or she has not previously been, nor is currently being, paid for essentially equivalent work by any agency of the Federal Government. Severe penalties may result from such actions.**

(d) **It is recommended that upon submission of your proposal you obtain a Dunn and Bradstreet Number. You will need this number to be eligible to receive an award. You can obtain this number free of charge by contacting Dunn and Bradstreet by phone at 1-800-333-0505 or on-line at http://www.dnb.com/US/duns_update/index.html**

This program solicitation is intended for information purposes and reflects current planning. If there is any inconsistency between the information contained herein and the terms of any resulting SBIR contract, the terms of the contract are controlling.

5.7 Research Projects with Human Subjects, Human Tissue, Data or Recordings Involving Human Subjects

Any proposal that includes research involving human subjects, human tissue, data or recordings involving human subjects must meet the requirements of the Common Rule for the Protection of Human Subjects, codified for the Department of Commerce at 15 CFR Part 27. Any questions regarding these requirements should be addressed to Dr. Joseph M. Bishop. Telephone: (301) 713-3565 or e-mail: joseph.bishop@noaa.gov.

5.8 Research Projects Involving Vertebrate Animals

Any proposal that includes research involving vertebrate animals (including fish) must be in compliance with the National Research Council's "Guide for the Care and Use of Laboratory Animals" which can be obtained from National Academy Press, 2101 Constitution Avenue, NW, Washington, D.C. 20055. In addition, such proposals must meet the requirements of the Animal Welfare Act (7 U.S.C. 2131 et seq.), 9 CFR Parts 1, 2, and 3, and if appropriate, 21 CFR Part 58. These regulations do not apply to proposed research using pre-existing images of animals or to research plants that **do not** include live animals that are being cared for, euthanized, or used by the project participants to accomplish research goals, teaching, or testing. These regulations also do not apply to obtaining animal materials from commercial processors of animal products or to animal cell lines or tissues from tissue banks.

6.0 SUBMISSION OF PROPOSALS

6.1 Deadline for Proposals

Deadline for Phase I proposal receipt (six copies) at the Contract Administration Branch is noon (EST) on January 19, 2005.

NOAA assumes no responsibility for evaluating proposals received after the stated deadline or that do not adhere to the other requirements of this solicitation (see checklist at back). Such proposals may be returned to the proposer without review.

Federal Acquisition Regulation (FAR 52 215-1) regarding late proposals shall apply. Letters of instruction will be sent to those eligible to submit Phase II proposals. The Phase II proposals are due at about the same time as Phase I final reports – seven months after commencement of the Phase I contract.

Proposers are cautioned to be careful of unforeseen delays that can cause late arrival of proposals at NOAA, resulting in them not being included in the evaluation procedures. No information on the status of proposals under scientific/technical evaluation will be available until formal notification is made.

6.2 Proposal Submission

Hardcopy submission of NOAA proposals should be sent in six copies to:

ATTN: SBIR Proposals
U.S. Department of Commerce, NOAA
Contract Administration Branch, Code OFA66
1305 East-West Highway, SSMC4
Silver Spring, MD 20910-3281
Telephone: (301) 713-0838

For local delivery, the Contract Administration Branch is located near the intersection of East-West Highway and Colesville Road, and close to the Silver Spring Metro stop.

Acknowledgment of receipt of a proposal by NOAA will be made. All correspondence relating to proposals must cite the specific **proposal number** identified in the acknowledgment.

(a) **Packaging. Secure packaging is mandatory. NOAA cannot process proposals damaged in transit. All six copies of the proposal must be sent in the same package. Do not send separate "information copies," or several packages containing parts of a single proposal, or two packages of six copies of the same proposal. The top copy must be signed as an original by the principal investigator and the corporate official. Other copies may be photocopies.**

(b) Bindings. **Do not use special bindings or covers**. Staple the pages in the upper left hand corner of each proposal. Separation or loss of proposal pages cannot be the responsibility of NOAA.

6.3 Warning

While it is permissible, with proper notification to NOAA, to submit identical or essentially equivalent proposals for consideration under numerous Federal program solicitations, it is unlawful to enter into contracts requiring essentially equivalent effort. If there is any question concerning this, it must be disclosed to the soliciting agency or agencies before award.

7.0 SCIENTIFIC AND TECHNICAL INFORMATION SOURCES

7.1 General Information

The following web pages may be sources for additional technical information:

http://www.noaa.gov http://www.lib.noaa.gov

7.2 Oceanography and Marine Science

Scientific information in the areas of oceanography and marine science may be obtained from organizations shown in the website
http://www.nsgo.seagrant.org/SGDirectors.html

8.1 TOPIC: Ecosystems

8.1.1N Subtopic: Biomolecular Detection Systems for Early Diagnosis of Declines in Coral Health

Conventional methods for determining the status of coral health rely heavily on gross measurements such as loss of live coral coverage or observations of disease outbreaks. Little quantitative information is available on the underlying causes and early diagnosis of deteriorating health of corals. A suite of new methods (e.g., immunological, genetic, chemical) specific for corals would be highly desirable. This suite of methods should allow reliable cellular/molecular measurements of physiological change associated with exposure to environmental and climatic stressors that may lead to disease or death. Full consideration should be given to the accurate identification and quantitative measurements of the molecular indicators of such changes and their role in normal or disrupted cell physiology. Ideally, these methods would allow assessment of cellular/physiological condition, monitoring of cellular stress response, identification of potential stressors, and forecasting of environmental response/events.

8.1.2N Subtopic: Underwater Differential Global Position System for Divers and Remote Platforms

NOAA is involved in a number of projects, which are mapping and cataloging the status and trends of submarine resources NOAA is mandated to manage. For purposes of change detection the programs require accurate positioning and identification of resources. This is often done on the water surface using Differential Global Positioning Systems (DGPS) combined with remote sensing platforms such as side scan sonar and videography. Transferring the positioning information between the surface and the submarine benthos is difficult and prone to error in calculation correction factors such as layback. Even more problematic is the accurate positioning of in situ divers working underwater to verify identification of resources and other benthic features. We are in need of an underwater DGPS system for use on remote platforms and for diver operation.

8.1.3N Subtopic: Quantitative Field Measurement for Dispersed Oil

One method for remediating spilled surface oil on water is to use chemical dispersants that lower the oil surface tension and aid dispersion of the oil into the water column. However, there is currently no easy way to quantify the effectiveness of dispersant applications. The present protocols supported by NOAA for monitoring dispersant operations recommend three levels, or tiers, of sophistication. Tier 1 is visual observation by a trained observer. Tiers 2 and 3 use a towed continuous flow fluorometer or multiple flourometers at various depths to register an increase in fluorescence from background. The presumption is that the increase is due to dispersed oil. However, oil is a mixture of hundreds of different chemical compounds with the aromatic compounds providing the main fluorescent component. The relative proportion

of aromatics changes from oil to oil and within the same oil as it weathers. This makes matching instrument readings in the field with dispersed oil quantity a severe challenge.

This subtopic requests the development of an inexpensive field-deployable instrument, along with appropriate protocols, that can provide accurate real-time quantitative measurement of total dispersed hydrocarbon concentrations caused by natural dispersion or chemical dispersant applications that are comparable to standard analytical methods for Total Petroleum Hydrocarbons (TPH). Such an instrument and protocols will not rely on further analysis and calibration from samples processed in the laboratory in order to make an estimate of volume dispersed. The apparatus and procedures should require minimal training and should provide protection from surface oil contamination.

References:

Barnea,N., R. Laferriere, 1999, SMART: Scientific Monitoring of Advanced Technologies. International Oil Spill Conference, American Petroleum Institute, Washington D. C., 1265-1267.

Lambert. P., M. Goldthorp, B. Fieldhouse, Z. Wang, M. Fingas, L. Pearson, E. Collazzi, 2003. Field fluorometers as dispersed oil-in-water monitors. J. of Hazardous Materials, 102:57-59.

8.1.4N Subtopic: Nutrient Sensors for Observing Systems

The development of an operational Integrated Ocean Observing System (IOOS) for the U.S. will require the infusion of innovative technology. While components and sub-systems exist to implement IOOS, the full value and sustainability of such a system will only be enhanced by addressing the technical limitations of currently available technology as well as devising new technical solutions to improve efficiency, reliability, and system responsiveness.

NOAA is a lead agency working to ensure that IOOS becomes a fully realized, sustained, and integrated system. NOAA must also help to ensure that the global environmental observing system includes access to, and the use of, advanced and efficient technology for observing and monitoring the environment (i.e., *in-situ* sensor instrumentation). Because an “integrated global environmental observation and data management system” is one of six cross-cutting priorities for NOAA, proposals submitted in response to this subtopic will address the four goals of the NOAA Strategic Plan.

Nutrient loading in coastal systems can be caused by processes such as tidal flushing, non-point source and point-source pollution runoff, upwelling, and other dynamic processes. There is an increasing need for nutrient sensors to be useful to a wide range of users, especially in monitoring for water quality, health, and regulatory purposes. Due to the variety of environments in which sensors may be deployed, the

most effective sensors will meet many requirements for assessing nutrient compositions and levels. Proposals should be generated for nutrient sensor development with the following characteristics:

- Resistant to biofouling
- Self-calibrating
- Able to provide data for multiple nutrients
- Capable of real-time data transmission
- Highly reliable
- Standardized in variable coastal environments

References:

Alliance for Coastal Technologies. State of Technology in the Development and Application of Nutrient Sensors. UMCES Technical Report Series: TS-415-03-CBL / Ref. No. [UMCES]CBL 03-316. Savannah, Georgia, March 10-12, 2003.

8.1.5SG Subtopic: Aquaculture: Developing and Improving Species Culture

Proposals are requested for research, which offers to make significant, industry-wide improvements in finfish, shellfish, and ornamental fish culture systems for both small scale and large-scale applications. Priority will be given to research, which finds innovative approaches that will solve major industry bottlenecks in an economically and environmentally compatible manner. Research aimed at new species for culture and research to adapt techniques being used successfully in other countries are appropriate.

8.1.6SG Subtopic: Aquaculture: Water Reuse and Effluent Treatment Systems

Proposals are requested for developing integrated aquaculture systems with minimum impact on the environment. These include development of innovative water reuse systems for ponds and raceways and other novel systems for treating effluent. Special priority will be given to prototype, modular water reuse systems suitable for producing a variety of species anywhere in the United States.

8.1.7SG Subtopic: Aquaculture of Marine Organisms for Marine Natural Products

Research in the past two decades has found that there are many marine organisms, which produce novel natural products of use in treating human diseases. To utilize these products commercially and in clinical trial, however, they need either to be chemically synthesized, produced using biotechnology, or produced through aquaculture of the organism. Research is needed to find economically cost-effective

and biologically viable ways to culture marine organisms specifically for their production of novel natural products.

8.1.8SG Subtopic: Open-Ocean Aquaculture

Both engineering and biological technology needs to be explored for the development of open-ocean or offshore culture systems. Large scale, offshore, submersible and floating systems need to be developed for Atlantic, Gulf of Mexico and Pacific conditions. Automation of feeding and harvesting functions as well as telemetry and remote control systems will be considered in this competition. The biological technology would include hatchery, nursery and transport systems for candidate species for open ocean-aquaculture. Field tests of candidate species are encouraged.

8.1.9SG Subtopic: Disease Diagnostics and Controls

Given the severe problems with aquaculture disease diagnostics and controls, we seek proposals in those areas aimed at reducing negative impacts on the U.S. aquaculture industry.

8.1.10SG Subtopic: Improved Aquaculture Diet Formulations

Projects are being sought to develop improved diets for marine species that are lower in fish meal content while maintaining the beneficial level of Omega 3 fatty acids and economic competitiveness. Projects that develop technologies for reducing any feed contaminants such as PCBs, pesticides and herbicides are also appropriate under this topic.

8.1.11SGM Subtopic: Sustainable Mechanized Harvesting of the Macroalgae *Chondrus crispus*

The purpose of this topic is to develop a method of mechanized sea moss harvesting that allows the sustainable exploitation of the substantial sea moss resource that lies in the inter-tidal and sub-tidal regions. The desired method will take advantage of recent developments in underwater robotics and sensing and will eliminate the need for scuba-supported control.

Proposals should address the issue of sustainable harvesting, both from the standpoint of sea moss productivity and the impact of the harvester on the substrate and fauna that may be using sea moss beds as habitat. Proposals should also address issues of cost effectiveness and harvesting unit size and how the proposed approach compares to hand harvesting or past approaches to mechanization with respect to productivity and impacts.

8.1.12F Subtopic: Inexpensive Sensors Based on Fouling for Early Warning of Contamination of Fisheries Environments

A threat to the productivity of national fisheries resources due to either intentional large-scale contamination of the marine environment, or incidental non-point source pollution over a period of time, can have serious implications on the food supply. The vast expanse of the fisheries makes the routine monitoring of water quality using the state-of-the-art chemo-biological sensors expensive and impractical. A compelling need clearly exists for an inexpensive, small, non-power consuming, sensor, that will function as a sensitive early-warning devices that monitors the health of the ecosystem. The envisioned device must maintain calibration over long periods of marine exposure and ideally allow visual assessment of data (without the need for any specialized equipment). The kinetics of development, the composition and the succession in macrofoulant invertebrate colonies are well known to be sensitive to low levels of pollutants in the marine environment. The change in colony parameters readily visible to a trained observer should therefore be indicative of low-level contamination of the fishery. We request a Phase I study that might demonstrate the utility of foulant colonies on a suitable substrate as a widely deployable semi-quantitative sensor of the health of fisheries and oceans in general. Realistic low-level contamination that impacts the food web of the fishery must be observable by this approach. The design of the device may include a means to concentrate the organic toxicant/pollutant species to obtain a magnified response. Ideally, the design may allow the sampling and identification of the responsible chemical species as well.

References:

Boreo, F., 1984. The Ecology of Marine Hydroids and Effects of Environmental Factors, Marine Ecology, 5, 93-118.

Hatcher, A. M. 1998. Epibenthic Colanization Patterns on Slabs of Stabilized Coal-waste in Poole Bay, Hydrobiologia, 367, 153-162.

Moran, P.J. 1993. Larval Settlement of Marine Fouling Organisms in Polluted Water from Port Kembla Harbour, Australia, Marine Pollution Bulletin, 26, 512-514.

8.1.13F Subtopic: Development of a Digital Video Plankton Recorder

Plankton identification and enumeration is a highly specialized, time consuming part of the Northeast Fisheries Science Centers monitoring and research programs. Most large-scale plankton monitoring programs utilize depth-integrated samplers such as bongo nets (Jossi and Marak,1975) or gulf nets (White and Connolly, 2000). Newly developed ecosystem monitoring models (Werner *et al.*, 1996, Lough *et al.*, 2003) require vertically stratified plankton data. This type of data is currently only available from specialized MOCNESS (Weibe *et al.*, 1985), multinet, or towed V-fin video

plankton recorder (Davis *et al.*, 1996) cruises. Because of the expense, the large number of experienced scientists, the amount of specialized equipment, and the time and expertise needed to process each sample, it be difficult if not impossible to integrate this type of cruise into a long term, large scale plankton monitoring program.

We request funding to develop and field test a two camera, self-contained digital VPR. Two adjustable frame cameras will allow enumeration of larger zooplankton and microplankton simultaneously. Development of a graphical user interface will permit identification and measurement of individual zooplankton images, which can then be merged with data from oceanographic sensors. Mounting the system on our 1m MOCNESS system will allow close quantitative and taxonomic comparisons between net sampling and the digital VPR accuracy.

The digital VPR offers technology easily transferred to other NOAA or commercial projects. With a slight change in mounting brackets the self contained VPR can be deployed on other oceanographic sampling gear such as CTDs, bongos, or a towed V-fin. The proposed computer software can append physical oceanographic sensor data from a variety of sources. The end-user graphical interface could be adapted for numerous sampling requirements. The small amount of lab space required makes it a system that is deployable on small sized research vessels, a foreign vessels, or ships of opportunity. The camera magnifications can be changed to accommodate different research goals. The self-contained system requires no modification of ships terminations, no conducting core wire, nor specialized winches. The system can be set up by technical personnel then run by any available technician with a minimal of training. Once development and sea testing is completed the self contained digital VPR will be a cost effective, accurate, alternative to current net type samplers.

References:

Davis, C.S., S.M. Gallager, M. Marra and W.K. Stewart (1996) Rapid visualization of plankton abundance and taxonomic composition using the Video Plankton Recorder. Deep-Sea Research II, 43, 1947-1970.

Jossi, J.W., and R.R. Marak (1983) MARMAP Plankton Survey Manual. U.S. Dep. Commerce, NOAA Tech. Rep., NMFS-F/NEC-21, 258 pp.

Lough, R.G. L.J. Buckley, F.E.Werner, J.A. Quinlan, and K. Pherson-Edwards (2003) A general biophysical model of larval cod growth: comparison of May 1993 vs 1994 observations on Georges Bank. in prep.

Weibe, P.H., A.W. Morton, A.M. Bradley, R.H.Backus, J.E.Craddock, V.Barber, T.J.Cowles, and G.R.Flierl (1985) New development in the MOCNESS, an apparatus for sampling zooplankton and micronekton. Marine Biology, 87, 313-323.

Werner F.E., R.I. Perry, R.G. Lough, and C.E. Naime (1996) Trophodynamic and advective influences on Georges Bank larval cod and haddock. Deep-Sea Research II, 43, 1793-1822.

White, J., P.Connolly (2000) Retrospective study analysis, Report of the fisheries application meeting, The Marine Institute, Dublin, Ireland, 86 pp.

8.1.14F Subtopic: Submersible *In Situ*, Sediment Grainsize Device

A number of programs in NOAA-Fisheries are currently moving into phases where continuous moving measurement fish habitats are being made. Observations from towed sleds permit mapping of habitat and resource distribution in a way never before accomplished. But, measurements of sediment characteristics have not kept pace with temperature, salinity, chemical, and even fish observations (from cameras and multiple closing nets).

Current approaches to marine grainsize measurement rely on processing discrete grab samples in shore-based laboratory analyses using lasers and computers. While this relatively rapid instrumental method has superseded the tedious gravimetric methods based on wet settling rate, an order of magnitude increase in sampling frequency is needed. Measurement systems need to be deployed directly in the habitat with other instruments to make continuous demersal observations.

Particle size devices that are similar to the needed system have been used both towed and fixed in river systems to estimate sediment transport (e.g., Melis *et al*. 2002). We suggest one approach might be to miniaturize the system used in rivers (Gray *et al*. 2002; Melis *et al*. 2002) with the development of a submersible chip-laser based grainsize device that can be mounted on towed sleds and even on SeaBoss (a "dropped" sampling system). The sediment will likely have to be systematically suspended before analysis. This will likely be easier in the towed format than the more static "dropped configuration.

The proposed device would generate horizontal grainsize distributions, which would permit mapping of Essential Fish Habitat at a new level, which is necessary to place Fisheries Management within an Ecosystem approach. It seems likely that a successful device would have a wide market as a new approach to marine and freshwater habitat characterization.

References:

Gray, J. R., G.D. Glysson and D.S. Mueller. 2002. Comparability and Accuracy of Fluvial-sediment Data – A View from the U.S. Geological Survey. Turbidity and other sediment surrogates workshop, Glysson, G.D., and Gray, J.R., eds: http://hydroacoustics.usgs.gov/reports/jrgpaper.pdf

Melis, T.S., Topping, D.J., and Rubin, D.M., 2002, Testing laser-based sensors for continuous, in-situ monitoring of suspended sediment in the Colorado River, Grand Canyon, Arizona, *in*, Turbidity and other sediment surrogates workshop, Glysson, G.D., and Gray, J.R., eds: http://water.usgs.gov/osw/techniques/TSS/Meliseta.pdf >(June 12, 2002).

8.1.15F Subtopic: Bluefish-Specific Monoclonal Antibodies

Induction of biotransformational enzymes are commonly used as indicators of exposure to anthropogenic contaminants in fish (Goksoyr and Forlin, 1992). Two enzymes that have been used extensively as biomarkers of exposure are Cytochrome P4501A (CYP1A) and Vitellogenin (Vtg) (Sarasquete and Segner, 2000; Kime et al. 1999). The diagnostic tests used for the detection of these proteins require an enzyme-specific antibody. Currently, there are no available antibodies against these two proteins that have been purified from bluefish. Researchers attempting to answer questions of exposure of bluefish to contaminants are forced to use antibodies produced from other fish species. It is unclear whether any of the currently available antibodies are sufficiently similar to cross-react with the appropriate bluefish protein. The fact that *Pomatomus saltatrix* is the sole member of the Family: Pomatomidae means there are no closely related species that can be substituted. This makes it difficult to determine which if any of the available host-species would make an appropriate surrogate.

Bluefish are an important and popular recreational and commercial species that has experienced a substantial decline in landings in recent years, raising concerns about stock sustainability. The availability of bluefish-specific antibodies for CYP1A and Vtg would provide an important monitoring tool to determine the extent and magnitude of the population's exposure to anthropogenic contaminants, a critical factor in understanding the health of the population. Companies such as Biosense and Caymen Chemicals currently sell antibodies against both of these proteins, produced from several different host-species, and they are regularly adding new species as they become available. It is expected that successful production of antibodies against CYP1A and Vtg from bluefish would have wide commercial potential as indicators of exposure to anthropogenic contaminants in this important species

8.1.16F Subtopic: Engineering of New Aquaculture Containment Systems for Offshore Aquaculture in the United States Exclusive Economic Zone (EEZ)

Marine Aquaculture is predicted to be a significant global industry for food production. Aquaculture, while developing rapidly in other developed countries and in Asia, has been slow to develop in U.S. Coastal waters because of competition for aquatic space. Off shore aquaculture, located in the EEZ will alleviate problems in shore through better dispersal of organic wastes, avoidance of navigational and recreational conflicts and will preserve the aesthetic values of inshore habitats. However, wind and wave stresses of the high energy exposed offshore areas present significant technical challenges in the

design and construction of secure containment systems required of the culture of fish and shellfish species

The purpose of this topic is topic is to further the development of and engineering of odd shore aquaculture systems that can withstand sustained high wind and wave energy environments while providing an environment conducive to the propagation of emerging commercially valuable marine species in the EEZ.

Proposals should be directed to all aspects of offshore containment systems including: evaluation and deployment, design of physical structures, computer and physical modeling of net pens (surface or submerged and mooring systems, ROV and robotic techniques, remote monitoring technology feed delivery systems and harvesting devices, design of associated service vessels and predator exclusion barriers.

References:

Byrd, B. 2001. State of the Art of Removing Large Platforms Located in Deep Water, Twachtman, Snyder, and Byrd, Inc., November, 2000. Minerals Management Service. http://www.mms.gov/tarprojects/372.htm

Bridger, J. Christopher. Project Coordinator Pictures Ocean Spar Cage Deployed in Federal Waters 22 miles off Mississippi. http://www.olemiss.edu/orgs/SGLC/1aquaculture.html

Funge-Smith, S. Phillips, M.J. 2001. Aquaculture systems and species. R.P. Subasinghe, P. Bueno, M.J. Phillips, C. Hough, S.E. McGladdery & J.R. Arthur, eds. Aquaculture in the Third Millennium. Technical Proceedings of the Conference on Aquaculture in the Third Millennium, Bangkok, Thailand, 20-25 February 2000. pp. 129-135. NACA, Bangkok and FAO, Rome. http://www.fao.org/DOCREP/003/AB412E/ab412e07.htm

Gulf of Mexico Offshore Aquaculture Consortium Abstracts 2002 http://www.msstate.edu/dept/crec/aquaoffspubs.html

Puerto Rico at the cutting edge of offshore aquaculture. Snapper Farm, Inc. To learn more about offshore aquaculture projects and technology. http://www.oar.noaa.gov/spotlite/archive/spot_snapperfarm.html

Schrope, Mark. Technology Review, April 19, 2001. Aquaculture Cleans Up Its Act Researchers investigate recirculating water from fish farms, and moving them farther offshore. http://www.technologyreview.com/articles/print_version/schrope041901.asp

The Rationale For a New Initiative in Marine Aquaculture. NOAA 2002. http://www.nmfs.noaa.gov/trade/AQ/AQWPPrint.pdf

8.2 TOPIC: Climate

8.2.1G Subtopic: Climate Applications for Enhanced Decision-Making

The NOAA Strategic Plan aligns the agency's efforts along four major goals, one of which is to "understand climate variability and change to enhance society's ability to plan and respond." A desired outcome of that goal is enhanced public and private sector planning and decision-making through better access, understanding, and use of climate information. The objective of this subtopic of the FY2005 NOAA SBIR announcement is to affect that climate outcome by stimulating innovative development of commercial, private-sector applications that utilize operational or experimental climate forecasts and/or datasets.

Weather- and climate-sensitive industries are believed to account for about one-third of the US gross domestic product, underscoring the need, which is central to NOAA's strategic goals, for improving the relevance of climate science to decision-makers in their development of adaptation responses to variability and long-term changes in the climate.

Accordingly, proposals are solicited for development of tailored products for either broad or niche markets that would benefit from application of climate information to their decision-making processes. Such decision support tools could include (but would not be limited to):

- Prediction systems
- Customized datasets
- Information delivery systems
- Decision management processes

In developing such applications, applicants for funding are advised to pay strict attention to the following criteria for consideration for funding:

1. Readiness. In addition to the required assessment of the commercial potential of the proposed application, which is implicit to the SBIR proposal process, it is essential to demonstrate in the proposal the rationale for believing that:

    a. The requisite climate data or forecasts exist at a level of accuracy and availability to support the proposed application, and

    b. The target market for the application is capable of utilizing the proposed application in its decision-making processes.

    In brief, not all climate signals or market sectors are created equal in their readiness to utilize climate-based decision support tools. Preference, at this early stage of developing such commercial applications should and will be given,

in the selection process, to the most climate-ready applications. Applicants for funding are urged to include in their proposals citations to readily available (journal or web-based) studies to demonstrate these points to reviewers.

2. Time-scale. Because this request for proposals is focused entirely on climatic time scales, applications that are deemed to fall primarily within prediction or forecast time scales that are strictly meteorological will not be considered for funding. Clearly, a continuum exists from time scales that are generally thought of as "weather" (e.g., up to two week forecasts) to those thought of as "climate" (intraseasonal-to-seasonal to interseasonal-to-annual or longer), and clearly some applications could span both time scales. However, applications must be focused primarily on climatic time scales to be deemed worthy of consideration.

3. Sources of information. To the greatest extent possible, applications should draw on well-vetted and well-documented sources of climate forecasts and/or datasets. For example, operational climate forecasts may be (but do not have to be) drawn from the NOAA Climate Prediction Center (**http://www.cpc.noaa.gov/products/forecasts/**) or the International Research institute for Climate Prediction (**http://iri.ldeo.columbia.edu/climate/forecast/**). If applications are proposed based upon experimental research products, then proposals should address such issues as quality control, assurances of data availability, future migration to "operational" status, etc.

4. Uniqueness. Eligibility for funding under the SBIR program is limited to technological applications that are not available in the marketplace.

Proposals that address this SBIR subtopic have potential to be inherently multidisciplinary in nature, with content spanning physical and social sciences. Applicants for funding are asked, therefore, to consider the challenge this will present to reviewers, and are urged to fully reference and define all concepts, acronyms, and studies alluded to in the narrative. Because applications are likely to be highly specialized, applicants are invited to submit recommendations for unconflicted reviewers, though SBIR management will not be bound to utilize those reviewers. Applicants are further advised that new starts in FY 2005 will be limited and that competition for awards to launch this new NOAA thrust is expected to be vigorous.

8.2.2G Subtopic: Autonomous pCO_2 Measurement Systems for Volunteer Observing Ships and Research Vessels

The world's oceans take up more than 40% of the annual release of fossil fuel carbon. To pinpoint the locations of oceanic uptake, and more importantly, to assess if this uptake will change in the future it is imperative to understand the processes responsible. In addition, the oceanic uptake together with the atmospheric growth rate and fuel emissions offers a robust constraint on terrestrial fluxes. Due to the spatial and temporal variability of terrestrial fluxes, they are particularly difficult to quantify.

The NOAA Office of Global Program's Global Carbon Cycle Program is interested in developing autonomous instruments to measure pCO_2 for use aboard research vessels and volunteer observing ships. Potential customers include NOAA, national, and international investigators working on producing global ocean CO_2 flux maps.

Specifications for the pCO_2 systems are as follows. Measurements should be based on equilibration and subsequent analysis by non-dispersive infrared analysis. Gas calibration standards should be used. Accuracy of water pCO_2 values should be within 2 matm and air pCO_2 values to within 0.2 ppm. The system must be capable of running autonomously for up to one month.

8.2.3G Subtopic: Multi-Parameter Discrete Sample Carbon Analyzer

The Global Carbon Cycle Program solicits the commercial development of a system to collect water samples for analysis of total dissolved inorganic carbon (DIC), total alkalinity, and partial pressure of carbon dioxide, pCO2. Current measurement techniques in ships and laboratories are inefficient with respect to water and personnel requirements for obtaining water aliquots for each parameter. An automated distribution system that could "feed" several analyzers at the same time from a single water sample would greatly increase seagoing and laboratory efficiency. Potential customers include NOAA, and national and international investigators working on hydrographic cruises and ships of opportunity.

Specifications for the analytical systems are as follows: The instrument should be based on a single water dispersing system that supplies aliquots for multiple analyzers. Analyses should include DIC, total alkalinity, pCO2, and nutrients. Accuracy of the various carbon parameters should be within 1-2 mmoles/kg for DIC, 3-4 mmoles/kg for total alkalinity, and 1-2 matm for water pCO_2.

8.2.4G Subtopic: Documentary Video for Climate Education and Outreach

The concept underlying NOAA's suite of weather products and services evolved from successes made in the 2-5 day forecasting done by the National Weather Service. With the increasing development of predictive understanding of the earth's climate system that is emerging from climate research programs, and with the increasing availability of high speed computer processing, the world is poised to experience, for the first time, climate products and services. These products will go beyond the 2-5 day weather forecast; they will address seasonal variation, annual variability and even speculate a decade or century into the future.

Because NOAA is at the forefront of this revolution in knowledge and information, it is important that the agency tell this story to many audiences and stakeholders, ranging from domestic to international. Indeed, NOAA bears the responsibility of explaining to US taxpayers what it is we are proposing to do, and what it is we are investing their climate prediction dollars in. The agency has the intellectual "superstars," the national

climate mandate, and the corresponding international obligations. The agency seeks the assistance of the small business community to effectively communicate this information.

Accordingly, this solicitation invites the national community of independent video producers to develop a ready-to-go treatment for a commercial, half-hour documentary that would tell the new, emerging NOAA climate story, incorporating efforts ranging from NOAA laboratories and joint institutes to extramural research partners. Target markets for this video could include, but would not be limited to, cable outlets (including educational channels), television networks, or specialized television like The Weather Channel, or Discovery.

The SBIR model of an initial pilot and then a carefully judged entry into Phases 2 and 3 would be ideal to calibrate the quality, accuracy and depth of the content of the program envisioned. This proposed project is conceptually similar to a previous successful SBIR-funded project in which the collective works of a print document (Reports to the Nation On Our Changing Planet) were transformed into a commercially-viable interactive CD that took the embedded science and made it available to a much wider audience than NOAA would, otherwise, have reached.

8.2.5R Subtopic: Automated Flask Sampler for Halocarbons and other Atmospheric Trace Species

Atmospheric trace gases will contribute to three significant environmental issues facing Americans in this century: climate change, stratospheric ozone depletion, and deteriorating air quality. Carbon dioxide is the most important greenhouse gas and is the focus of the North American Carbon Program (NACP, see http://www.esig.ucar.edu/nacp/). The measurement of halocarbons and other atmospheric trace species, many of which are both greenhouse and ozone-depleting gases, will be useful to the NACP to separate human influences on carbon cycle gases from those of the terrestrial biosphere.

We are requesting proposals for a prototype of an automated and unattended flask sampler that would fill up to 12 stainless steel or glass flasks (1 - 4 L volume) to 40 psia according to a user-defined schedule. Automated glass flask samplers have been developed by the Carbon Cycle Greenhouse Gases Group of NOAA's Climate Diagnostics and Monitoring Laboratory in Boulder, Colorado. The design of the system has included a battery operated pump and a separate package containing the flasks. The problem with these samplers is that they have parts with elastomers that often add contamination of halocarbons, hydrocarbons, and other gases like carbonyl sulfide (COS) to the sample. The flask-sampling device we require would sample the atmosphere without adding or removing trace gases in an air stream at the part-per-trillion (ppt) level. It would also allow for filling flasks made of electropolished stainless steel or glass. We mention this because of the different requirements involved in closing valves on flasks of different types. The device would be powered with rechargeable batteries or allow operation with 120 VAC.

For examples of halocarbon flask sampling results, please search the literature for the authors: J.H. Butler, J.W. Elkins, or S.A. Montzka. We envision that Phase II will require fifteen of these samplers to be built for ground-based, oceanic, and airborne platforms. The sampler should have an option to allow sampling from aircraft where the air being sampled is at low pressure (50 to 100 mbar). We imagine that an automated, non-contaminating, flask sampling device would find wide use in many applications including air pollution studies, indoor air pollution studies, security surveillance of humans entering sensitive zones, and collecting air samples in suspected biological and nuclear dirty explosions for Homeland Security.

8.2.6R Subtopic: Autonomous Systems for Measurement of Aerosols from Light Airplanes

Atmospheric aerosols contribute to climate change by scattering and absorbing solar and terrestrial radiation, and by altering the microphysical and radiative properties of clouds. Aerosols are responsible for the greatest uncertainties in current estimates of human effects on climate, and lack of observations of aerosol properties is a major cause of the large uncertainties. In particular, there are relatively few observations of the vertical profile of aerosol chemical, microphysical, and radiative properties, and those that exist generally come from short-term intensive field campaigns. Light airplanes are being used to monitor the vertical profiles of aerosol radiative properties, but the cost and complexity of aerosol inlet and sampling systems preclude widespread deployment of the dedicated airplanes needed for this approach. An alternative approach is suggested by the vertical profiling system under development for the North American Carbon Program (NACP), which uses autonomous, suitcase-sized samplers in chartered airplanes to collect air samples. An autonomous aerosol sampler, attached to the exterior of the airplane and sampling from the free airstream, could provide regular measurements of aerosol vertical profiles by piggy-backing on the NACP flights, or from deployment on planes of opportunity, e.g., short-haul air cargo planes. The key to success is simple and autonomous operation: the sampler should be entirely self-contained, easy to attach to and remove from the airplane, and require no operator intervention during the flight.

The purpose of this topic is to further the development and engineering of autonomous samplers that can be used to obtain vertical profiles of aerosol properties from light airplanes. Relevant properties include aerosol size distribution, light scattering and absorption coefficients, optical depth, cloud condensation nucleus concentration, chemical composition, and mass concentration. Proposals should be directed to complete systems for measurement of one or more of these properties. The systems should include provisions for internal data acquisition, determination and recording of time and position, flow control, and battery power. The steps needed for approval for operation in the Normal or Restricted category of Part 91 of the Federal Aviation Regulations should also be included in the proposal.

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Strategic Plan for the U.S. Climate Change Science Program. A Report (364 pages) by the Climate Change Science Program and the Subcommittee on Global Change Research. http://www.climatescience.gov/Library/stratplan2003/default.htm, see in particular Chapter 3.1.

Wofsy, S.C. and R.C. Harriss, 2002: The North American Carbon Program (NACP). Report of the NACP Committee of the U.S. Interagency Carbon Cycle Science Program. Washington, DC: US Global Change Research Program. http://www.carboncyclescience.gov/nacp.pdf See also http://www.cmdl.noaa.gov/ccgg/aircraft/index.html

8.3 TOPIC: Weather and Water

8.3.1W Subtopic: Predictive Modeling of Solar Insolation in the Marine Environment for Solar Power System Applications

The use of solar panels in remote, offshore power system applications as a source of environmentally clean, re-usable energy has, to date, made use of solar insolation model predictions based on historical short wave solar radiation data collected from land-based sensors to estimate the solar panel area required for a given power system application. When these models are applied to power system applications in the offshore marine environment, they do not take into account either historical measurements of solar radiation from offshore sources, nor do they properly extrapolate land-based measurement data to the offshore environment, and in the case of buoy-based applications, do not account for platform motion due to wind and waves that decrease the total available solar energy input to a solar panel power system.

The purpose of this topic is to further the development of predictive solar insolation models for application to solar power systems used in the marine environment on a platform in constant motion, in order to improve the accuracy of predictions and properly size solar panel power systems for use on these platforms. The National Oceanic and Atmospheric Administration's (NOAA) National Data Buoy Center (NDBC) has collected short wave solar radiation data in the offshore marine environment for a number of years in several offshore regions around the continental United States, Alaska, and Hawaii. In addition, a number of academic and government organizations such as the Wood's Hole Oceanographic Institute, University of South Florida's Coastal Ocean Monitoring and Prediction System (COMPS), and Environment Canada have collected solar radiation data from offshore platforms for El Niño research, climate monitoring, and heat flux studies. The available historical data from buoy-mounted and other offshore solar radiation sensors could be used to develop predictive models for offshore power systems solar insolation by month, season, and location in many areas of the offshore continental United States, Alaska, and Hawaii. In addition, buoy platform motion could be taken into account to derive more accurate models for predicting solar availability on offshore platforms subject to constant wave motion and rotation of the platform due to winds and current.

Proposals should be directed to compiling offshore solar radiation measurement data from available sources in offshore areas of the continental U.S., Alaska, and Hawaii out to the US Exclusive Economic Zone (200 miles offshore), developing a model for average platform motion of buoys subject to wave motion and platform rotation, and using these data to develop a solar insolation prediction model for the offshore environment by month and season.

Reference:

National Data Buoy Center web site, http://www.ndbc.noaa.gov/, for background information on NDBC and its programs.

8.3.2W Subtopic: NOAA Weather Radio (NWR) Broadcast Simulator

NOAA Weather Radio is the voice of the National Weather Service (NWS). It s the primary means to satisfy a mission critical need to deliver warnings of severe weather and other life threatening All-Hazard events (nuclear, chemical, biological accidents, earthquakes, etc.) directly from forecasters to the public most immediately and specifically at risk. The NWS operates a network of over 900 NWR VHF stations for this purpose in the United States, Puerto Rico, the Virgin Islands, and Pacific Trust Territories. NWS. Expansion and Upgrade of NWR is part of the Strategic Plan.

The NWR is the primary and most timely means of getting warnings of severe weather and other life threatening hazards directly to the public. It provides an effective warning service to those with disabilities. NWR receivers are programmable to allow the listener to set his receiver for only those events of interest to him in his specific locale. NWR is being expanded to provide broadcast in Spanish. The Consumer Electronics

Association, in partnership with NOAA NWS, developed a Public Alert standard (CEA-2009) based on NWR receiver specifications and a certification program to assure new products meet the standard. Thomson RCA recently spent millions of dollars to integrate NWR into television sets and is currently marketing them through every Target store in the country. Canada will adopt the NWR SAME protocol for its recently revitalized Weather Radio program. NOAA NWS is partnered with the U.S. Congress, the U.S. Department of Agriculture, the U.S. Coast Guard, the National Marine Fisheries Service, the Federal Emergency Management Agency in the Department of Homeland Security and the National Telecommunications and Information Administration's Institute for Telecommunications Science in expanding NWR coverage and providing improved emergency message delivery to the public. Getting emergency warnings to those immediately at risk depends on being able to easily assess NWR broadcasts, evaluate system performance, and quickly troubleshoot and isolate system failures. Since NWR broadcasts on special frequencies using a unique Specific Area Message Encoding (SAME) protocol, off-the-shelf communications test equipment for end-to-end NWR testing is currently not available.

The objective of this effort is to (1) design an NWR Broadcast Simulator capable of providing a calibrated broadcast test signal as described in CEA-2009 and (2) to build and test prototype systems based on that design. There is no simple, convenient way to perform tests on the NWR broadcast chain or NWR receiver systems, either in the laboratory or in the field, such that performance can be quickly and uniformly evaluated at any location. There is also no easy way to effectively demonstrate system performance during outreach to the public, the emergency management community, government, and industry. Currently, one must either assemble several specialized pieces of equipment into a system or use live or taped broadcasts from a local NWR station to simulate a broadcast. The first alternative is cumbersome, lacks portability, uniformity, and calibration. The second is limited to a single, one-minute test done once every week or a recording of that test message. Neither of these is a viable alternative for operational system evaluation. There is a critical need for a small, portable, dedicated, calibrated, microprocessor-based simulator designed specifically to evaluate NWR system performance.

As a special test instrument, the simulator would provide calibrated, low level NWR Radio Frequency outputs with SAME signals into a standard antenna at all NWR frequencies as defined in the CEA-2009 Standard. This will allow receiver sensitivity and SAME activation to be assessed on any receiver at any location in a few seconds. It would store up to ten complete emergency warning messages. It would have a computer interface to allow programming of event and location codes and complete messages. It would provide a calibrated audio stream and digital stream needed for end-to-end testing and adjustment of the entire NWR broadcast chain - from Weather Forecast Office to NWR station antenna, including remote monitoring equipment functions. It would provide external PC controlled generation of signals necessary for effective dynamic, scripted, multi-media voice and text demonstrations of NWR SAME capabilities to potential stakeholders.

There are numerous uses for such a device among the many widespread users of NWR. Every NWS Office, Center, and maintenance contractor needs one for operations and maintenance. Every local and state emergency operations center and every school district (in states that have supplied NWR receivers to schools) could use one for periodically verifying correct operation. Every AM, FM, TV, and cable station needs one for on-demand testing of their Emergency Alert Systems NWR activation. NWS and Regional Headquarters would use them in their outreach programs to more effectively demonstrate the All-Hazard capabilities of NWR SAME. Manufacturers of NWR, Public Alert, and EAS equipment need the device for testing, evaluating, and CEA Public Alert certification of new products and for quality control on their production lines. There would a great market for a low cost, hand held consumer grade version for demonstrating NWR emergency warning operation at Radio Shack stores, at all Target stores for RCA AlertGuard television sets, or for in-home testing.

References:

Consumer Electronics Association Standard – CEA 2009 .- see www.ce.org for information

NOAA NWS Weather Radio Website at www.nws.noaa.gov/nwr

8.3.3N Subtopic: In-Field Detection of Harmful Algal Bloom Toxins and/or Toxigenic Species

Methods for detecting harmful algal bloom (HAB) toxins and toxigenic species are generally laborious, time-consuming and require expensive laboratory equipment. State and federal resource managers are often required to make quick decisions to protect human health with limited data so there is a need for quick, accurate tests for toxins or HAB cells that can be used in the field. The ultimate goal is to develop methods for inexpensive, accurate, rapid, and quantitative detection of toxins and toxigenic organisms specific to a given geographical region, but methods that facilitate the decision process for resource managers without meeting all of the goals will also be considered.

8.3.4N Subtopic: Portable HAB Monitoring System for Small Aircraft of Opportunity

Detection and monitoring of harmful algal blooms (HABs) currently involves logistically demanding fieldwork. Satellites have proved useful for characterizing HABs in some oceanic areas, but not immediately adjacent to shore. Some of the existing aircraft-based imaging systems have potential capabilities for higher resolution, but are costly and require dedicated aircraft. A need exists for a portable system that can provide color discrimination and be readily mounted on small planes of opportunity. As certain HABs are caused by dinoflagellates, which may absorb more ultraviolet (UV) radiation than diatoms and other algae, the system should have the capability to detect some UV

as well as visible bands. This package allows for a routine monitoring capability that can be applied in all integrated and sustained ocean observing system regions.

8.3.5W Subtopic: Measurement of Profiles of Temperature and Water Vapor in the Marine Environment from Moored Buoys

The marine atmospheric environment is typically very complex, and is a driving factor for weather prediction in adjacent coastal areas as well as downstream synoptic forecasts well inland. Yet, there are very few observations in this environment of the vertical distribution of critical state variables such as temperature and humidity. Satellite observations are available on a relatively coarse spatial scale, but do not well capture the critical lower portion of the atmosphere including the marine boundary layer. The addition of a temperature and humidity profiling capability to a moored buoy would greatly increase the data available for human and numerical analysis and prediction.

There are existing land-based radiometric temperature and water vapor profilers, but none designed or modified for use on a moving platform in a marine environment.

The purpose of this topic is to determine the feasibility of radiometric profiling from a moored platform. After determining the additional complicating factors which the moving, power-limited buoy platform in a marine environment presents, a demonstration of a suitably built or modified profiler should be performed on an NDBC buoy.

Reference:

National Data Buoy Center web site, www.ndbc.noaa.gov, for background information on NDBC and its programs.

8.3.6W Subtopic: Measurement of Sea Surface Salinity by Passive Microwave in the Marine Environment from Near-Surface Platforms

Salinity is one of the most fundamental oceanographic parameters needed for ocean prediction, hydrologic cycle analysis and climate change analysis. Much of the variability of salinity occurs in the coastal regions populated by the NWS/NDBC Marine Observation Network (MON) buoys. However, marine bio-fouling complicates the measurement of salinity, particularly from platforms, which cannot be frequently serviced.

Salinity can be sensed by passive microwave means, and radiometers have flown in space and on aircraft demonstrating this capability. The adaptation of a radiometer to sense salinity operationally from a moored buoy or other near-surface marine platform has not been attempted.

The purpose of this topic is to determine the feasibility of passive microwave salinity sensing from a marine near-surface platform, which will enable long-term stable measurements with minimal periodic maintenance. After determining the additional complicating factors, which a moored or fixed platform in the marine environment presents, a demonstration of a suitably built or modified radiometer should be performed on an NDBC buoy or CMAN (Coastal Marine) station.

Reference:

National Data Buoy Center web site, www.ndbc.noaa.gov, for background information on NDBC and its programs.

8.3.7W Subtopic: Low-Cost Floating Wave Staff Data Buoys for Offshore Monitoring

Commercial and recreation boating activity in the coastal zone out to one hundred miles offshore will greatly benefit if the wave conditions over the entire area can be reported to the vessel operators with a thirty-minute or more frequent temporal resolution and a spatial resolution of twenty-five miles or closer.

Proposals should address the design and construction of a low-cost floating instrument platform that measures wave conditions (height, period, direction) and broadcasts this information via a modulated wireless signal. The value of other environmental variables, such as barometric pressure, air temperature, water temperature, wind speed/direction, etc. may also be included in the broadcast wireless message.

The vessel that requires this environmental information will carry a special wireless receiver that automatically detects the wireless broadcasts from the data buoys near its location (within a radius of 100 miles) and displays it to the vessel's operators.

When manufactured in quantities of 5,000 or more, the entire wave- (and other variable-) measuring data buoy should be expendable, that is, should cost no more than $2,000. The wireless receiver and display system on the vessel should cost approximately $200.

The entire deployed monitoring system design (data buoy and data display on vessel) should make effective use of modern digital-signal processing and digital-wireless-signal communication techniques. It is expected that a judicious selection of microelectronic sensors and components will also be required for the final design.

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8.3.8W Subtopic: New Data Telemetry Protocol for Automated Flood Warning Systems (AFWS)

AFWS help to save lives and reduce property damage by providing critical rain and stream gage data from remote locations via radio telemetry. They make an important contribution to the National Weather Service's flash flood forecasting mission, and their information is indispensable to many other federal, state, and local agencies responsible for emergency planning and water resource utilization. As demand for data has increased, users have recognized that AFWS hold tremendous potential for public benefit in ways not originally envisioned. The AFWS user community has proposed many creative ideas to collect data for expanded hydrometeorological uses, environmental protection, climate monitoring, highway safety, and homeland security. Unfortunately, such advancements cannot be fully realized until a new AFWS radio telemetry protocol is developed. Most existing AFWS transmit data using the "ALERT" protocol, whose 1970's technology limits data transmission content and dependability.

The purpose of this subtopic is to develop and demonstrate a modernized, open source radio telemetry standard that is compatible with the existing ALERT protocol. The new standard could potentially be adopted by all software and equipment developers, and will accelerate growth and implementation of remote data collection products. An improved protocol should: a) retain the current event-driven reporting architecture; b) contribute radio frequency spectrum conservation; c) maximize channel carrying capacity; d) enhance the ease of data acquisition, transmission, and sharing within a wide user community; e) perform reliability in remote and occasionally environmentally hostile surroundings, with minimal underlying component maintenance; and f) work in mixed networks that maintain backward compatibility with existing systems. Possible approaches include the use of: a) current radio transmission technology with higher data rates in narrowband channels; b) open squelch with message detection and long

bit-frame synchronization patterns; c) robust error detection and forward error correction technologies; and d) layered protocol stacks.

The resulting protocol should be adaptable to multiple vendor platforms as a non-proprietary standard. A successful new protocol will spur small business growth and provide a wide range of benefits to the public safety, environmental monitoring, and water resource management communities.

Reference:

Automated Local Flood Warning Systems Handbook (Weather Service Hydrology Handbook No. 2, February 1997). US Dept of Commerce, NOAA, NWS, Office of Hydrology 1325 East-West Highway, Silver Spring MD 20910-3283. http://www.nws.noaa.gov/oh/docs/alfws-handbook/.

8.3.9E Subtopic: Short-Term Severe Weather Forecasting

The ability to forecast severe weather has improved considerably over the past few decades. Technological advances such as the implementation of the operational Doppler radar network in the late 1980's and early 1990's, improved satellite observations, more accurate computer forecasts of severe storm environments, and better understanding through research at government-sponsored laboratories and universities have all contributed to the improved forecast accuracy. The current lead-time of National Weather Service tornado warnings is about 12 minutes, with goals to improve this to 16 minutes by 2009. This improvement will result from continued research and technological advances.

The purpose of this topic is to further the development of severe weather forecasting by innovative research that utilizes theory, models and/or observations. The private sector is involved in many operations that require short-term forecasts of severe weather. For example, weather modification projects require knowledge of where and when storms (both severe and non-severe) will form, and techniques have been developed for these operational purposes. However, it is likely that many of these private sector techniques have not made their way into the mainstream of operational weather forecasting.

Proposals should be directed towards all aspects of severe weather, with an emphasis on research that has the potential to lead to improved forecasts of hail, tornados and high winds associated with thunderstorms through the use of satellite observations. Satellite imager and sounder data can be utilized in the development of short-term forecast applications and in the assimilation of these data into mesoscale forecast models.

References:

National Weather Service Government Performance and Results Act Goals 2004-2009: http://www.nws.noaa.gov/com/files/perfmeasures/all2004.pdf

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Woodley, W.L. and D. Rosenfeld. 2004. The development and testing of a new method to evaluate the operational cloud seeding programs in Texas. J. of Applied Meteor., 42, 249-263.

8.3.10R Subtopic: Microsensors for Marine Chemical Measurements

The purpose of this research is to develop a prototype marine instrument deployable on fixed, towed or autonomous platforms capable of providing chemical compound and/or microbial identification and quantification. Identifying and quantifying the chemical compounds that make up marine nutrients and contaminants currently requires time consuming and costly field sample collection and laboratory analyses. Microsensors manufactured with techniques derived from the integrated circuit industry represent an opportunity to develop next-generation marine sensors with improved measurement capabilities at lower cost. Technologies such as quartz crystal microbalance, surface acoustic-wave, and silicon integrated circuit structures can be applied in the marine environment to allow direct extraction of data in the field or to provide survey information during field sampling efforts. These technologies do not employ colorimetric measurement requiring chemical reagents. Instrumentation utilizing this technology will be applicable to marine environmental research, environmental monitoring and municipal drinking water quality assessment.

Contaminants and nutrients of interest along with detection goals:

	Range	Resolution
Persistent Organic Contaminants	0-1 ppm	1 ppt
Phosphate	0.5-3.0 ug P/L	0.1 ug P/L
Silica	0.1-2.0 mg SiO2/L	0.1 mg SiO2/L
Dissolved Oxygen	0-12 mg/L	0.01 mg/L

Nitrate-nitrogen (NO3)	0.01 - .5 mg N/L	0.01 mg N/L
Ammonium-nitrogen (NH4)	5 - 50 ug N/L	1.0 ug N/L
Chloride	10-50 ug Cl/L	1.0 ug Cl/L

8.3.11R Subtopic: Identification and Quantification of Reactive Gaseous Mercury Species in the Atmosphere

Mercury contamination is emerging as a critical public health issue[2]. The critical route of human exposure is fish consumption. For most aquatic ecosystems, atmospheric deposition is the most significant loading pathway. There are three different atmospheric mercury forms[3] – elemental mercury, particulate mercury, and a water soluble, "sticky" form called *reactive gaseous mercury* (*RGM).* Each form behaves differently, and RGM is the most prone to dry and wet deposition. Chemical reactions interconvert the three forms in the atmosphere.

Unfortunately, it has not yet been possible to determine the actual chemical species comprising RGM in the atmosphere. The measurement of the "pool" of species comprising RGM has been done operationally[1], with measurement techniques exploiting one or more of the unique physical chemical properties of the RGM group (e.g., water solubility). However, in order to understand the chemical transformation processes occurring in the atmosphere, the actual chemical species must be identified and quantified. Important species may include (but are not limited to) $HgCl_2$, $HgBr_2$, HgO, Hg $(OH)_2$, and the relative concentrations of different RGM species will of course vary in space and time.

The goal of this subtopic is to develop a device that can identify and quantify particular RGM species in any given atmospheric sample. The analysis should be done in as close to real time as possible. It is hoped that an instrument can be developed that will be able to be applied widely. The task is challenging, as RGM is typically present at exceedingly low atmospheric concentrations (5 – 100 pg/m3). Moreover, it generally dissolves into ionic forms in water (e.g., $HgCl_2$ dissociates into Hg^{+2} and two chloride ions), and the original speciation is lost. For this reason, analysis of aqueous solutions of RGM will not generally yield the needed information regarding the actual species originally present in the atmosphere. Thus, a gas-phase analysis method will most likely be required.

References:

1. Landis, M., Stevens, R., Schaedlich, F., Prestbo, E. 2002. Development and characterization of an annular denuder methodology for the measurement of divalent inorganic reactive gaseous mercury in ambient air. Environmental Science and Technology 36, 3000-3009.

2. Mahaffey, K., Clickner, R., Bodurow, C. 2004. Blood organic mercury and dietary mercury intake: National Health and Nutrition Examination Survey, 1999 and 2000. Environmental Health Perspectives 112, 562-570.

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8.3.12R Subtopic: Photon Counting Detector for 0.9- to 2-Micron Wavelength Range

Automated laser-based remote sensing systems called differential absorption lidars (DIALs) are being developed by NOAA to profile atmospheric constituents such as water vapor and carbon dioxide. Measurements from these lidars are potentially useful for weather prediction and climate change studies. DIALs measure very low light levels and require reasonably priced (<$10K) photon counting detectors with active areas >500 microns. At the present time, such detectors only exist at wavelengths below 1 micron. It would be preferable to operate the lidars at longer wavelengths where there are higher eye-safe laser power limits and a lower solar background. Approaches for achieving efficient photon counting at these wavelengths include InGaAs avalanche photodiodes in Geiger mode and InGaAs alloy photomultiplier tubes.

The purpose of this topic is to further the development of near infrared (0.9- to 2-micron) photon counting detectors minimally covering the range 1490 to 1580 nm. The desired detector would be compact, turn-key, and require no extreme (e.g. liquid nitrogen) cooling. For lidar applications, the largest possible dynamic range is desired, and the detector must exhibit no afterpulsing. (Afterpulsing is a signal tail following an intense pulse of light.) Other specifications (as expected after the completion of a Phase II or Phase II SBIR) are listed in the table below.

Parameter	Phase I Specification	Phase II Specification
Active Area Diameter	>200 microns	>500 microns
Dark Counts	$<10^5$ counts per second	<2000 counts per second
Detection Efficiency	>1%	>10%
Maximum Count Rate	$>10^6$ counts per second	$>10^6$ counts per second
Linearity	±15	±1
Operational Life	>1 year	>2 years
Afterpulsing	minimal	none
Cryogenic cooling	allowed	none

8.3.13R Subtopic: Compact Multibeam Echo Sounder (MBES) for Autonomous Underwater Vehicles (AUVs)

Autonomous underwater vehicles (AUVs) are growing in acceptance and deployment across the ocean research community. Recognizing the value of AUVs in increasing the cost effectiveness of ocean research and exploration, the Office of Ocean

Exploration (OE) has promoted their use by NOAA programs and partners. A fundamental element of ocean exploration is mapping the seafloor. A key tool in such mapping is multibeam echo sounders (MBES). Unfortunately, thus far, very few AUVs have been equipped with MBES. A key consideration is the high power demands and large size of existing MBES products.

The purpose of this topic is to further the development and engineering of MBES so that they can be more widely deployed in AUVs. In particular reducing the size and power demands of MBES so that they may be accommodated in smaller (under 13" diameter) AUVs is desired. The core capability required is the collection of bathymetry and, where possible, surface and subsurface sediment data. High frequencies (over 200 KHz) are desirable for both higher resolution and more compact systems. A swath width of approximately four times the water depth beneath the AUV and a range (above the seafloor) of up to 200 meters are desired in a compact MBES. Low power demands, if possible under 50 Watts are important to small AUV MBES.

Proposals should be directed to new technical approaches to MBES. While increased miniaturization of existing MBES designs and equipment is welcome, novel design concepts are particularly encouraged. In addition to system specifications, proposals should provide a case study of how they might be integrated into an existing small AUV.

References:

Commercial Survey Company using an MBES equipped AUV
http://www.cctechnol.com/

J. Manley, "Autonomous Underwater Vehicles in the National Oceanic and Atmospheric Administration," Proceedings of Underwater Intervention 2004, ADC/MTS, New Orleans, LA, February 2004.

R. George, L. Gee, A. Hill, J. Thomspon and P. Jeanjean, "High-Resolution AUV Surveys of the Eastern Sigsbee Escarpment," Proceedings of Offshore Technology Conference, Houston, TX, May 2002.

8.3.14R Subtopic: Development of a Measurement Technique for Formaldehyde and Hydrogen Peroxide that can be Operated Aboard Aircraft

NOAA is responsible for obtaining important new information concerning the atmospheric environment. In this regard, two atmospheric compounds, formaldehyde and hydrogen peroxide, play important, yet poorly understood, roles in atmospheric chemistry (refs.). Formaldehyde is known to be an essential intermediate in photochemical ozone formation (smog). Hydrogen peroxide is known to be involved in the conversion of sulfur dioxide to sulfuric acid, which is the principal component of acid rain and is, in part, responsible for the formation of aerosols in the atmosphere (regional haze). As a consequence, it is essential to better understand the sources and

processes that are responsible for the formation and loss of formaldehyde and hydrogen peroxide in the atmosphere. This essential environmental information will in turn be made available to decisions makers, who are responsible for air-quality management. In order to provide this information, NOAA requires adequate techniques to measure formaldehyde and hydrogen peroxide from research aircraft. Accordingly, these measurements are essential to meet the goals of both the Climate and Air Quality Matrix programs.

In order to fulfill the research requirements, the instrument must be able to directly determine very small concentrations of formaldehyde and hydrogen peroxide that are expected to be present in the atmosphere. In the projected research applications, the technique will be used for airborne measurements. Accordingly, it should be light, small, and consume modest power at voltages available on research aircraft operating in the in the atmosphere at altitudes of up to 45000 ft. Because the technique will be deployed on aircraft, it must be of rugged design able to withstand crash loads of up to 9 g, yet light-weight and sufficiently small in size to fit in the limited space available as part of a larger science payload.

The measurements should be continuous and rapid response. The measurement technique should not alter the concentration of formaldehyde or hydrogen peroxide in the air to be sampled nor affect the equilibrium of gas and aerosol phase distribution of the analytes. The measurements require high specificity to uniquely identify the target species in the natural mix of gases in ambient air. The system should be capable of producing an on-line readout of the concentration of the compounds in the atmosphere. Performance specifications needed for the measurement techniques are given in Table 1. At this time instruments meeting such specifications are not commercially available.

Table 1

Requirement	Desired Specifications	
	Formaldehyde	**Peroxide**
Operational	Suitable for aircraft deployment at altitudes of up to 45000 ft	Suitable for aircraft deployment at altitudes of up to 45000 ft
Weight	≤ 250 lbs.	≤ 250 lbs.
Power	110 VAC at 400 Hz preferred	110 VAC at 400 Hz preferred
Dimension	Must fit into standard aircraft mounting rack (19” x 26” x 48”)	Must fit into standard aircraft mounting rack (19” x 26” x 48”)
Detection limit	≤ 0.1 parts per billion by volume in air	≤ 0.1 parts per billion by volume in air
Measurement uncertainty	± 20%	± 20%
Response Time	≤ 1 sec.	≤ 1 sec.

Proposals should be directed to fulfilling the requirement for fast response, highly selective, lightweight, and robust instruments for high sensitivity measurements of hydrogen peroxide and formaldehyde. The instrument should be capable of operating unattended on NOAA's research aircraft. Although separate instruments are

acceptable, a single instrument that is capable of meeting both requirements is highly desirable.

References:

Calvert, J. G. et al., Chemical mechanism of acid generation in the troposphere, Nature, 317, 27-35, 1985.

Kleinman, L. I., Seasonal dependence of boundary layer hydrogen peroxide concentration: low and high NO_x regimes, *J*. Geophys*. Res.,* 20,721–20,733, 1991.

Wert, B. P., et al, Signatures of terminal alkene oxidation in airborne formaldehyde measurements during TexAQS 2000, *J.* Geophys*. Res., 108(D3),* 4104, doi:10.1029/2002JD002502, 2003.

8.3.15R Subtopic: Space Weather Industry

A significant demand for space weather information is anticipated as high-tech systems that can be affected by extraterrestrial radiation are being brought on-line. Companies in the business of selling and supporting satellite constellations, cellular phone transmission, space travel, and power distribution, to name a few, will require space weather forecasts, improved models, and data. In order to meet these demands, NOAA is seeking innovative models and products for users. In developing such concepts it will be useful to consider the embryonic space weather industry as an analog to present developments in the meteorological and communications industries. The National Weather Service now supports a growing private industry based on its data and services. The purpose of this solicitation is to request proposals that will assist private industry in the development of space weather services. An understanding of the type of products that are now available can be obtained in products shown on NOAA Weather Wire space weather products, and at the Website at sec.noaa.gov/Data. Most of the data that is available to companies that wish to develop space weather services is on the Website. For information concerning the desired outcomes call (303) 497-3992.

8.3.16R Subtopic: Continuous Real-Time Boundary-Layer Wind Vector Profiles in Hurricanes

NOAA Hurricane Research Division (HRD) has a requirement for operational boundary layer wind profile measurements in hurricanes from 5,000 ft to, and including, the surface with 15-30 m vertical resolution capable of resolving low-level wind maxima. The system must also measure vertical velocity and surface wind speed and direction. It must complement the existing system on the NOAA Aircraft Operations Center (AOC) WP-3D aircraft for surface wind speed measurement using the Stepped Frequency Microwave Radiometer (SFMR), as well as the Tail Doppler Radar system for mapping the 3D hurricane wind fields throughout the hurricane down to the 1,500 ft level and within a radius of 50 nm from the aircraft. The wind retrievals must be accomplished in

real time and transmitted to NOAA/ NCEP Environmental Modeling Center (EMC) and NOAA/NCEP Tropical Prediction Center (TPC) in a similar manner to the existing Tail Doppler system, whose data is presently undergoing integration into the next generation of couple operational hurricane intensity prediction models at EMC. HRD will assimilate the high-resolution continuous profile measurements into an analysis scheme designed to illustrate the spatial variation of low-level wind maxima and other transient features in the hurricane boundary layer for use by forecasters at TPC.

The Phase 1 effort should demonstrate the feasibility of an affordable, solid-state radar design prior to the fabrication of a complete system during Phase 2. The system should operate unattended and have the capability to produce and display boundary layer wind speed and direction profiles in real time and transmit these profiles at one-minute intervals to EMC, TPC and HRD for integration into tropical cyclone intensity prediction models.

8.3.17R Subtopic: Airborne Radar Sensor for Measurement of Ocean Wave Directional Spectra in Hurricanes

The NOAA Hurricane Research Division (HRD) and NOAA Environmental Modeling Center (EMC) has a requirement for observations of directional ocean wave spectra in hurricanes to provide data for: 1) improvement of air-sea flux parameterizations, and 2) initialization and validation of the new generation of coupled atmosphere-ocean-wave hurricane intensity prediction models. The new model architecture, called HWRF, is being developed at the CEP/Environmental Modeling Center (EMC) for use at NCEP/ Tropical Prediction Center (TPC) with new aircraft data products provided by HRD. EMC requires real time directional wave spectra to initialize and validate their wave predictions used in the coupled model and TPC requires wave spectra for validation of their forecast of the radius of 12-foot seas by quadrant relative to tropical cyclone centers. Further, these operational centers require directional wave observations for validation of storm surge forecasts at landfall, which include wave run-up estimates in the total surge forecast.

Compact, airborne remote sensing systems capable of real-time directional ocean wave spectra measurement can provide an effective and important input to the above requirements. In recent years, a prototype high-resolution 36 GHz Scanning Radar Altimeter (SRA) has been tested on NOAA hurricane research and reconnaissance aircraft. With post-flight processing, the SRA provided the first comprehensive measurements of the sea surface directional wave spectra in all quadrants of the tropical cyclone. Partitioning the wave spectra into swell components and locally generated sea state enabled determination of the characteristics of these components, i.e. height, steepness, propagation direction, and the mapping of their spatial variation.

Recent advances in solid-state millimeter microwave components and signal-processing technology suggests that a compact, unattended system can be developed to provide real-time display of ocean surface wave spectra for operational monitoring of wave properties and air-sea interaction processes in tropical cyclones. In addition to providing

input to model air-sea parameterization schemes, forecasts of 12-foot wave height radius and operational wave, surge and intensity prediction models, this sensor can complement other remote sensor measurements of the hurricane surface wind field.

The Phase I effort should demonstrate the feasibility of an affordable, solid-state radar design prior to the fabrication of a complete system during Phase 2. The system should operate unattended and have the capability to produce and display sea surface directional wave spectra in real time and to transmit these spectra from the aircraft to operational centers such as EMC and TPC and to HRD for integration into tropical cyclone prediction models.

8.4 TOPIC: COMMERCE and TRANSPORTATION

8.4.1N Subtopic: Development of a Multipath Mitigation Global Positioning System (GPS) Antenna for Geodetic Applications

Multipath remains the dominant error source in differential carrier phase positioning and navigation systems. The GPS antenna development should investigate techniques such as beamforming/beamsteering, different correlation techniques (narrow, strobe, or second derivative correlators) and maximum likelihood estimation using a GPS software receiver to evaluate different multipath mitigation techniques rapidly. The prototype antenna/receiver will be tested on a National Geodetic Survey (NGS) calibration baseline and compared to the “standard” NGS choke ring antenna configuration used in the Continuously Operating Reference Stations (CORS) network. The multipath mitigation antenna/receiver will also be evaluated with the NGS reference antenna in a high multipath environment.

8.4.2N Subtopic: High Resolution Surface Current Mapping in Harbors

The NOS has installed the Physical Oceanographic Real-Time System (PORTS) in many harbors and bays to promote safe and efficient marine transportation. A primary requirement of the maritime community for these systems is the observation of water currents at selected locations. The NOS Center for Operational Oceanographic Products and Services (CO-OPS) uses upward-looking Acoustic Doppler Current Profilers (ADCP) mounted on the ocean bottom and cabled to shore. While this configuration provides a good current profile throughout the water column, it is a single point observation that is relatively costly and difficult to maintain. In areas where current structures are complex and vary within small spatial scale (such as Newark Bay, NJ), or in confined waterways with winding channels, the maritime community requires many more ADCPs than can be reasonably procured or maintained. For example, pilots have identified fourteen locations in the Hampton Roads portion of the southern Chesapeake Bay alone. Remote sensing in the form of radar surface current mapping systems is an approach more appropriate to the spatial coverage required, but existing systems cover too wide an area with resolution too coarse for harbors and waterways. Existing shore-

based High Frequency (HF) Doppler radar surface current mapping instruments cover up to 50 thousand square kilometers with a grid spacing of 6 x 6 kilometers, or as small as 150 square kilometers with a grid spacing of 200 x 200 meters.

CO-OPS seeks a robust sensing system to observe water currents on space and time scales suitable for harbors, (i.e., in the order of 10 x 10 meters grid spacing, near real-time reporting at hourly or shorter time intervals), with errors less than 10 cm/sec. The ideal system must be operative in both fresh and salt water, and under most conditions experienced in the harbor and bay environment. Preference is given to shore-based observations for ease of maintenance and access to data. Another critical feature is that the system should be modestly priced in order to sustain a healthy commercial market.

References:

CODAR Ocean Sensors. 2003. SeaSonde system specifications. http://www.codaros.com/hr_seasonde_specs.htm

Teague, C. C., Vesecky, J. F., and Fernandez, D. M. 1997. HF radar instruments, past to present. Oceanography, 10(2), pp. 40-44.

8.4.3N Subtopic: Multibeam Sonar System for AUV Applications

A design is sought for a small, low power, multibeam sonar suitable for use and installation in an AUV. A typical installation in an AUV of about 8 inches diameter is preferred. The goal of such a sonar system would provide wide area hydrographic/ bathymetric data collection. Ideally, the system should draw less then 15 watts of power, and operate on a frequency of 250-350 Khz. The design beam width should be no more than 1.5 degrees by 1.5 degrees and have a maximum range of 100 meters. The target swath width should be between 100 and 120 degrees, corresponding to 64 to 80 beams. Reasonable data storage (approximately 60 GB) should be provided. The format of the stored multibeam sonar data should be an industry standard; Triton-Elics "XTF" format is preferred. The system will increase sensing capability of the AUV and increase production of bathymetric products.

8.4.4N Subtopic: Real Time Position Determination for Underwater Vehicles

Innovations with commercial potential are sought incorporating new and emerging technologies related to Hydrographic applications supporting National Ocean Service (NOS) requirements. Needed research critical to the NOS mission includes development of measurement systems and techniques to facilitate use of autonomous underwater vehicles (AUV's) and remotely operated vehicles (ROV's) to acquire hydrographic data.

A system is sought to allow determination of real time position of underwater vehicles using the Global Positioning System (GPS). New methods are needed for using

Kinematic and Real Time Kinematic GPS (KGPS and RTK) technology, buoyed KGPS base stations for signal reception and computation of corrections, and technology for underwater broadcast of real time corrections so that underwater vehicles may record accurate position information along with the acquired hydrographic data.

8.4.5R Subtopic: Anti-fouling for bio-optical sensors and solar panels

Long-term deployment of moored and mobile systems in the ocean is critical to increased knowledge and new discoveries. Moorings, floats, gliders and solar powered autonomous underwater vehicles (AUVs) are now, or will soon be, widely used across the ocean research community. A fundamental challenge to the success of these systems is bio-fouling. This impacts both *in situ* sensors and solar panels.

The purpose of this topic is to identify and develop low power methods that allow optical surfaces of bio-optical instruments and/or solar panels to remain bio-fouling free for up to one year in the marine environment. Environmentally harmful solutions are not acceptable. Proposals should describe their technology and identify how it applies to bio-optical and/or solar systems currently in use. Solutions that are broadly applicable to multiple sensors and solar systems are preferred. Solutions unique to key ocean sensors or solar systems will be considered.

References:

Sensor, mooring, float, glider and/or solar AUV Manufacturers

http://www.esica.com/

http://www.falmouth.com/

http://www.mooringsystems.com/

http://www.oceanoptics.com/

http://www.sequoiasci.com/

http://www.sontek.com/

http://www.webbresearch.com/

http://www.wetlabs.com/

http://www.ysi.com/

9.0 SUBMISSION FORMS

9.1 NOAA/SBIR COVER PAGE

PROGRAM: NOAA/SBIR - SMALL BUSINESS INNOVATION RESEARCH	This firm and/or Principal Investigator ☐ has ☐ has not submitted proposals for essentially equivalent work under other federal program solicitations, or ☐ has ☐ has not received other federal awards for essentially equivalent work.
SOLICITATION NO.: DOC 2005-1	CLOSING DATE: January 19, 2005
NAME OF SUBMITTING FIRM	TAXPAYER ID NO.
ADDRESS OF FIRM (INCLUDING ZIP CODE + 4)	
TITLE OF PROPOSED PROJECT	
REQUESTED AMOUNT: $	PROPOSED DURATION: 6 MONTHS
SOLICITATION SUBTOPIC NO.	SOLICITATION SUBTOPIC TITLE

THE ABOVE ORGANIZATION CERTIFIES THAT: (Check appropriate box by hitting space bar)	YES	NO
1. It is a small business firm as defined on page 3.		
2. The primary employment of the principal investigator will be with the firm at the time of award and during the conduct of the research.		
3. A minimum of two-thirds of the research will be performed by this firm in Phase 1.		
4. It qualifies as a minority and disadvantaged small business as defined on page3.		
5. It qualifies as a woman-owned small business as defined on page 4.		
6. It will permit the government to disclose the title and technical abstract page, plus the name, address and telephone number of the corporate official if the proposal does not result in an award to parties that may be interested in contacting it for further information or possible investment.		

PRINCIPAL INVESTIGATOR/ PROJECT DIRECTOR	CORPORATE OFFICIAL (BUSINESS)	OTHER INFORMATION
NAME	NAME	YEAR FIRM FOUNDED
SIGNATURE DATE:	SIGNATURE DATE:	NUMBER OF EMPLOYEES Avg. Previous 12 mos. _____ Currently _____
TITLE	TITLE	HAS THIS PROPOSAL BEEN SUBMITTED TO ANOTHER AGENCY? Yes_____No_____
TELEPHONE NO. + AREA CODE	TELEPHONE NO. + AREA CODE	IF YES, WHAT AGENCY?
E-MAIL:	E-MAIL:	FAX #:

PROPRIETARY NOTICE

For any purpose other than to evaluate the proposal, this data shall not be disclosed outside of the Government and shall not be duplicated, used or disclosed in whole or in part, provided that if a funding agreement is awarded to this proposer as a result of or in connection with this submission of this data, the Government shall have the right to duplicate, use, or disclose the data to the extent provided in the funding agreement. This restriction does not limit the Government's right to use information contained in the data source without restriction. The data in this proposal subject to this restriction is contained on separate proprietary page(s).

9.2 NOAA/SBIR PROJECT SUMMARY FORM

NAME OF FIRM	AMOUNT REQUESTED
ADDRESS	PHONE # FAX # E-MAIL:
PRINCIPAL INVESTIGATOR (NAME AND TITLE)	
TITLE OF PROJECT	
SOLICITATION SUBTOPIC NUMBER	SOLICITATION SUBTOPIC TITLE
TECHNICAL ABSTRACT (LIMIT 150 WORDS)	
KEY WORDS	
POTENTIAL COMMERCIAL APPLICATIONS	

9.3 NOAA/SBIR PROPOSAL SUMMARY BUDGET

FIRM:	PROPOSAL NUMBER: (Leave Blank)
PRINCIPAL INVESTIGATOR:	
	PRICE
DIRECT LABOR:	$
OVERHEAD RATE:	$
OTHER DIRECT COSTS:	$
MATERIALS:	$
GENERAL AND ADMINISTRATIVE (G&A):	$
PROFIT:	$
TOTAL PRICE PROPOSED:	$ 0.00
TYPED NAME AND TITLE:	SIGNATURE:_____
THIS PROPOSAL IS SUBMITTED IN RESPONSE TO NOAA SBIR PROGRAM SOLICITATION 2005-1 AND REFLECTS OUR BEST ESTIMATES AS OF THIS DATE. **DATE SUBMITTED:_____**	

9.4 NOAA/SBIR BUDGET INSTRUCTIONS

The offeror is to submit a cost estimate with detailed information for each element, consistent with the offeror's cost accounting system. This does not eliminate the need to fully document and justify the amounts requested in each category. Such documentation should be contained, as appropriate, on a budget explanation page immediately preceding the budget in the proposal

1. Principal Investigator (PI).
The PI must be with the small business concern at the time of contract award and during the period of performance of the research effort. Additionally, more than half of the PI's time must be spent with the small business firm during the contract performance.

2. Direct Labor.
All personnel (including PI) must be listed individually, with the projected number of hours and hourly wage.

3. Overhead Rate.
Specify current rate and base. Use current rate already negotiated with a Federal agency, if available. If no rate has been negotiated, a reasonable overhead rate (10-15% is average) ma be requested, which will be subject to approval by NOAA. Overhead includes fixed costs not directly related to the research effort, e.g., rent, heat, light, facilities, telephones, maintenance, insurance, etc.

4. Other Direct Costs.
List all other direct costs which are not described above (i.e. consultants, subcontractor, travel, and equipment purchases). Each of the above needs a detailed explanation and elaboration of its relation to the project. (Up to $4,000 may be allocated for technical and commercial assistance.)

5. Materials.
The materials and supplied required for the project must be identified. There is also a need to specify type, quantity, unit cost, and total estimated cost of these materials and supplies.

6. General & Administration (G&A)
Specify current rate and base. Use current rate already negotiated with a Federal agency, if available. If no rate has been negotiated, a reasonable G&A rate may be requested, subject to approval by NOAA. G&A includes costs associated with managing and running the small business, e.g. computers, copier, marketing, charitable contributions, loans, gifts, entertainment, dues, etc.

7. Profit.
The small business may request a reasonable profit (about 7 percent of the costs is the average proposed)

10.0 NOAA/SBIR CHECKLIST

Please review this checklist carefully to assure that your proposal meets the NOAA requirements. Failure to meet these requirements may result in your proposal being returned without consideration. **Six copies of the proposal must be received by Noon EST January 19, 2005.**

_____ 1. The proposal is **25 PAGES OR LESS** in length.

_____ 2. The proposal is limited to only **ONE** of the subtopics in Section 8.

_____ 3. The proposal budget is for **$75,000 or LESS** (or $50,000 or less for those subtopics designated as "SG".

_____ 4. The abstract contains **no proprietary information** and does **not exceed** space provided on the Project Summary.

_____ 5. The proposal contains only pages of 21.6cm X 27.9cm size (8 ½" X 11").

_____ 6. The proposal contains **an easy-to-read font (fixed pitch of 12 or fewer characters per inch or proportional font of point size 10 or larger) with no more than six lines per inch**, except as a legend on reduced drawings, but not tables.

_____ 7. The **COVER PAGE** has been completed and is **PAGE 1** or the proposal.

_____ 8. The **PROJECT SUMMARY** has been completed and is **PAGE 2** of the proposal.

_____ 9. The **TECHICAL CONTENT** of the proposal begins on **PAGE 3** and includes the items identified in **SECTION 3.3.3** of the solicitation.

_____ 10. The **SBIR PROPOSAL SUMMARY BUDGET** has been completed and is the **LAST PAGE** of the proposal.

_____ 11. The P.I. is employed by the company.

NOTE: Proposers are cautioned to be careful of unforeseen delays that can cause late arrival of proposals, with the result that they may be returned without evaluation.

11.0 SBIR NATIONAL CONFERENCES

FEDERAL R&D OPPORTUNITIES
FOR
TECHNOLOGY INTENSIVE FIRMS

Sponsored by:
Department of Defense/National Science Foundation
In Cooperation with
All Federal SBIR Departments and Agencies

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Management Seminars in Marketing and Business Planning.

Working with Academia and the States.

National Critical Technologies.

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BOISE, ID NOVEMBER 1-4, 2004

For further information on this conference and upcoming 2005 conferences see:
SBIR Homepage: www.sbirworld.com